IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

AMPEX CORPORATION, Plaintiff, v. EASTMAN KODAK COMPANY, ALTEK CORPORATION and CHINON INDUSTRIES, INC., Defendants.	)	C.A. No. 04-1373-KAJ REDACTED

APPENDIX TO DEFENDANTS' ANSWERING BRIEF IN OPPOSITION TO PLAINTIFF AMPEX'S MOTION FOR SUMMARY JUDGMENT THAT U.S. PATENT NO. 4,821,121 IS NOT UNENFORCEABLE DUE TO INEQUITABLE CONDUCT

Collins J. Seitz, Jr. (#2237)
Jaclyn M. Mason (#4737)
CONNOLLY BOVE LODGE & HUTZ LLP
1007 North Orange Street
P.O. Box 2207
Wilmington, DE 19899
(302) 658-9141
cseitz@cblh.com
Attorneys for Defendants Eastman Kodak Company and Altek Corporation

Of Counsel:
William F. Lee
Michael J. Summersgill
Wilmer Cutler Pickering Hale and Dorr LLP
60 State Street
Boston, MA 02109
Tel: (617) 526-6000

S. Calvin Walden
Wilmer Cutler Pickering Hale and Dorr LLP
399 Park Avenue
New York, New York 10022
Tel: (212) 230-8800

Date: June 13, 2006

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digital

pdp11 processor handbook

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This handbook was designed, produced and typeset
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operating on a DECSYSTEM-20.

```
;       3) RESTORE REGISTERS
;       4) ISSUE AST EXIT DIRECTIVE
;
BA:     MOV     R0,-(SP)        ;PUSH (SAVE) R0
        MOV     R1,-(SP)        ;PUSH (SAVE) R1
        MOV     R2,-(SP)        ;PUSH (SAVE) R2
```

The position-dependent version of the subroutine contains a relative reference to an absolute symbol ($OTSV) and a literal reference to a relocatable symbol (BA). Both references are bound by the task builder to fixed memory locations. Therefore, the routine will not execute properly as part of a resident library if its location in virtual memory is not the same as the location specified at link time.

In the position-independent version, the reference to $OTSV has been changed to an absolute reference. In addition, the necessary code has been added to compute the virtual location of BA based upon the value of the program counter. In this case, the value is obtained by adding the value of the program counter to the fixed displacement between the current location and the specified symbol. Thus, execution of the modified routine is not affected by its location in the image's virtual address space.

STACKS

The stack is part of the basic design architecture of the PDP-11. It is an area of memory set aside by the programmer or by the operating system for temporary storage and linkage. It is handled on a LIFO (last-in/first-out) basis, where items are retrieved in the reverse of the order in which they were stored. On a PDP-11, a stack starts at the highest location reserved for it and expands linearly downward to a lower address as items are added to the stack.

You do not need to keep track of the actual locations into which data is being stacked. This is done automatically through a stack pointer. To keep track of the last item added to the stack, a general register always contains the memory address when the last item is stored in the stack. In the PDP-11, any register except register 7 (the PC) may be used as a stack pointer under program control; however, instructions associated with subroutine linkage and interrupt service automatically use register 6 as a *hardware* stack pointer. For this reason, R6 is frequently referred to as the system SP. Stacks in the PDP-11 may be maintained in either full word or byte units. This is true for a stack pointed to by any register except R6, which must be organized in full word units only. Byte stacks, Figure 5-1, require instructions capable of operating on bytes rather than full words.

The PDP-11/45/55 memory management unit, the KT11-C, implements separate instruction and data address space. In the PDP-11/34 and 11/60, there is no differentiation between instruction and data space. The two instructions MFPD and MTPD (Move to and from previous data space) execute identically to MFPI and MTPI.

United States Patent [19]

Inuiya et al.

[11] **4,152,722**

[45] **May 1, 1979**

[54] **RETRIEVAL SYSTEM**

[75] Inventors: **Masafumi Inuiya, Asaka; Hiroyuki Ueda, Tokyo, both of Japan**

[73] Assignee: **Fuji Photo Film Co., Ltd., Minami-ashigara, Japan**

[21] Appl. No.: **872,212**

[22] Filed: **Jan. 25, 1978**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 669,915, Mar. 24, 1976, abandoned.

[30] **Foreign Application Priority Data**

Mar. 24, 1975 [JP] Japan 50-35942

[51] Int. Cl.[2] H04N 7/18; G03B 23/08

[52] U.S. Cl. ..... 358/102; 353/27 A; 358/93; 358/210

[58] Field of Search ..... 358/102, 93, 104, 210; 353/26 K, 27 R, 27 A

[56] **References Cited**

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Primary Examiner—Howard W. Britton
Attorney, Agent, or Firm—Fleit & Jacobson

[57] **ABSTRACT**

A recording medium such as a microfiche bearing graphic information like a map in a reduced scale is provided in a retrieval unit including an optical projection system connected with a television type display device. The recording medium is moved with respect to the optical projection system by an X-Y moving device which is operated by an electric position signal. The electric position signal is given by a position detecting device. The position detecting device has a graphic information similar to that recorded in the recording medium and a detecting pen to point a desired spot on the graphic information and a joy stick to give the position signal to the X-Y moving device.

8 Claims, 6 Drawing Figures

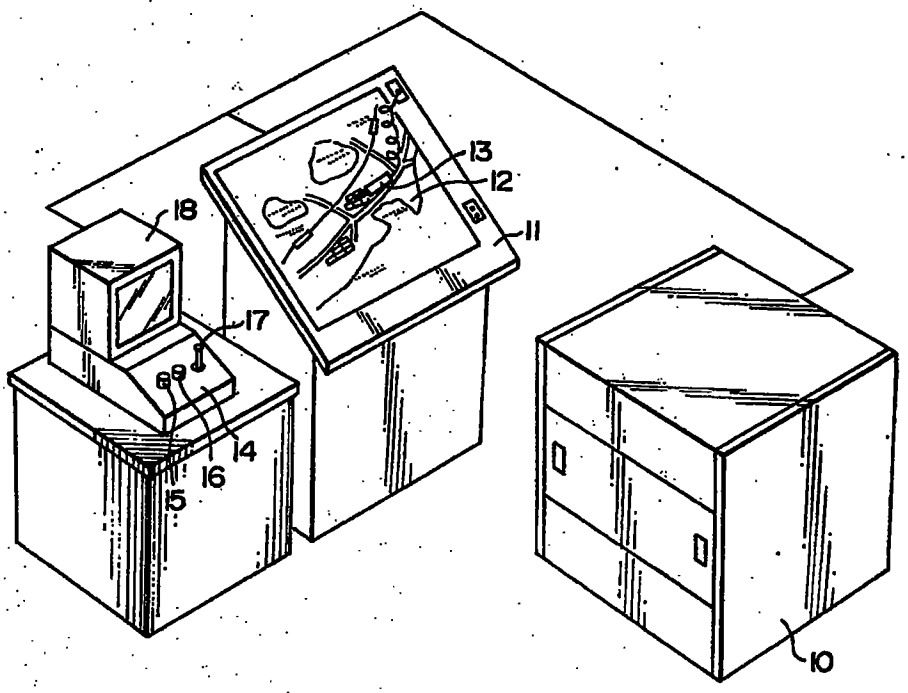


FIG. 1

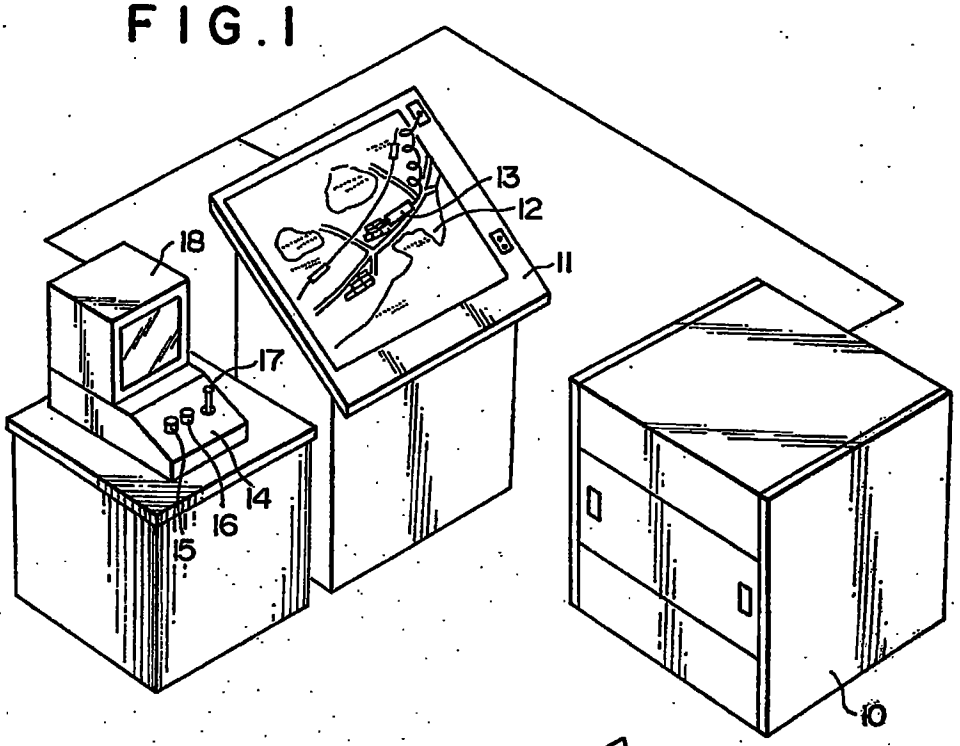


FIG. 3

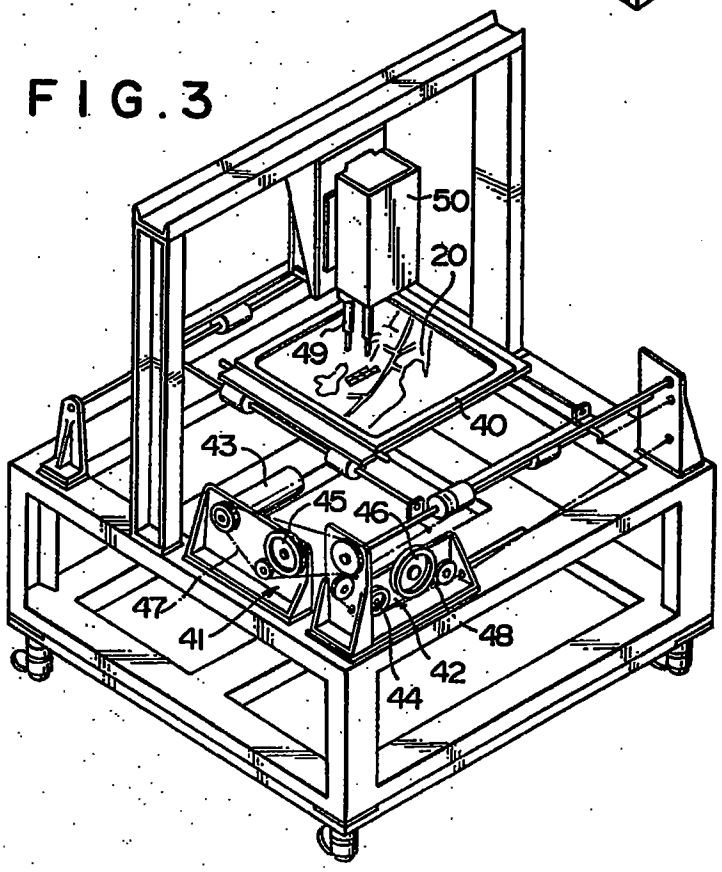


FIG. 2

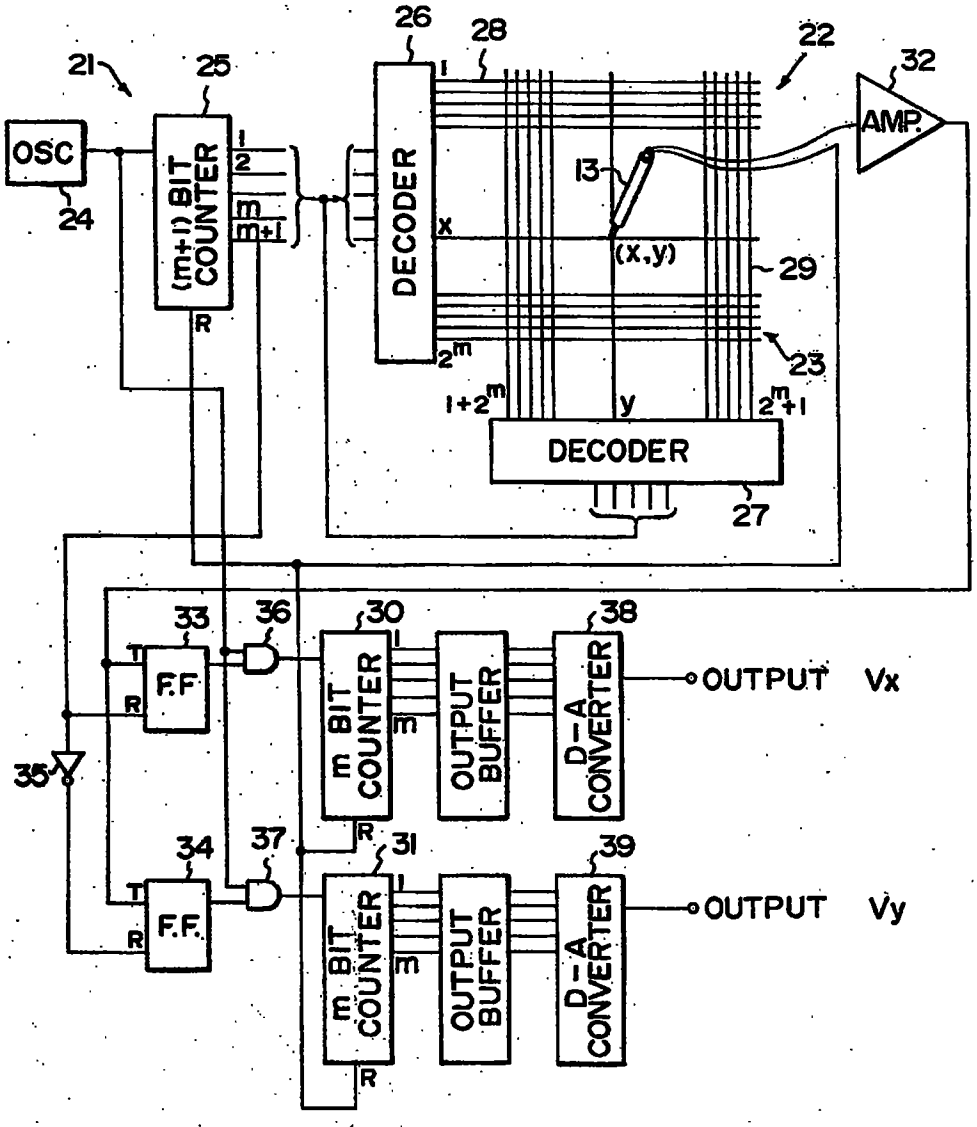

OSC
24
21
25
(m+1) BIT COUNTER
R
26
DECODER
28
22
32
AMP.
13
(x,y)
29
23
DECODER
27
33
F.F
36
30
m BIT COUNTER
OUTPUT BUFFER
38
D-A CONVERTER
OUTPUT Vx
35
34
F.F.
37
31
m BIT COUNTER
OUTPUT BUFFER
39
D-A CONVERTER
OUTPUT Vy

FIG. 4

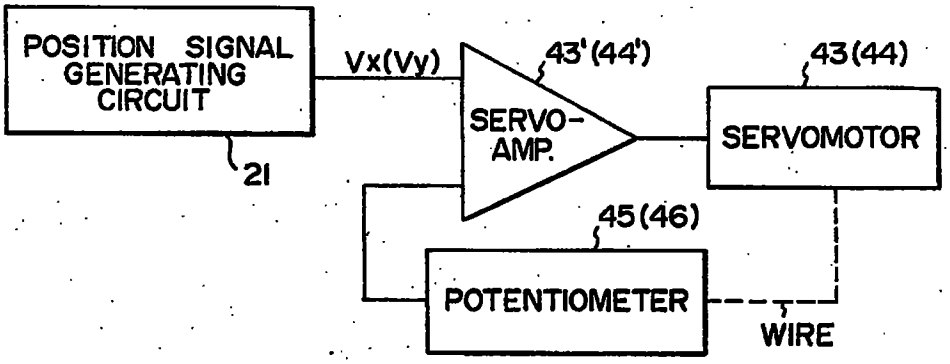


FIG. 5

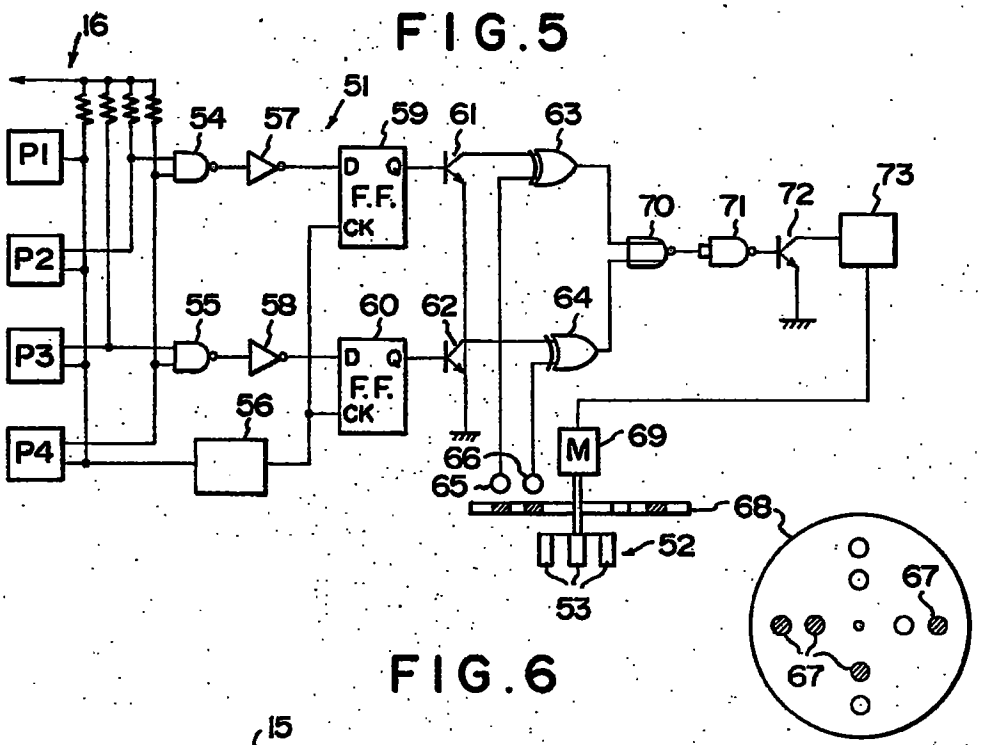
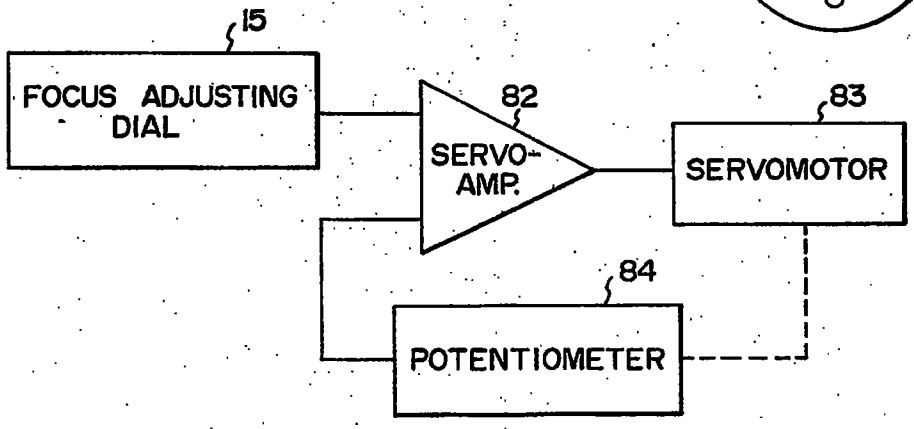


FIG. 6



RETRIEVAL SYSTEM

This application is a continuation-in-part of Ser. No. 669,915, filed Mar. 24, 1976, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a graphic information retrieval system, and more particularly to a system for retrieving a part of a graphic information such as a map recorded on a recording medium in reduced scale and displaying the retrieved part thereof in a display device in enlarged scale.

2. Description of the Prior Art

Drawings or figures bearing two dimensionally extending graphic information such as maps, circuit diagrams, piping plans and other kind of plans like blueprints are usually divided into several pages to facilitate the handling thereof. One of this kind of information divided into a number of pages is an atlas. The atlas includes a map of small reduction ratio in addition to a number of detailed maps of comparatively large reduction ratio so that a desired detailed map can easily be found. In a microfilm system, a map is divided into several image frames of a microfilm. Therefore, in practical use of the atlas or the microfilm map viewing system, it is necessary to turn the pages or to feed the frames several times to find a desired spot in the map. It is possible to connect a computer to a microfilm reading system to perform a direct retrieval of a spot of the map. However, this will need a great capacity of memory, which results in a great increase in the cost. Further, it is often desired to see a map along a road extending over several pages. In such a case, it takes a long time and needs a troublesome turning of the pages or feeding of the frames to see the map as desired.

Particularly in case of emergency in a police office, for instance, finding a spot on a map upon receipt of an emergency phone or the like, it is often desired to guide a squad car to the spot by viewing a road map. In other emergency works such as fire services, gas, water and electricity services also, it is required to quickly find the spot concerned.

SUMMARY OF THE INVENTION

The primary object of the present invention is to provie a graphic information retrieval system in which a spot on the graphic information such as a map or the like can be found easily and quickly.

Another object of the present invention is to provide a graphic information retrieval system in which the graphic information such as a map or the like can be displayed with various reduction ratios.

Still another object of the present invention is to provide a graphic information retrieval system in which a spot of the graphic information displayed can be varied continuously.

A further object of the present invention is to provide a graphic information retrieval system in which a spot of the graphic information such as a map or the like can be retrieved continuously along a line such as a road in a map.

The system in accordance with the present invention is characterized in that a figure which is similar to a figure recorded in reduced scale on a recording medium and displayed in enlarged scale on a display device is used for retrieving a spot in the figure. The system of this invention is applied to a figure retrieval system in which an information recording medium bearing an image of a map or the like in reduced scale is supported by and moved in X and Y directions by a holder and the image on the recording medium is displayed in enlarged scale on a display device. By moving the recording medium in the X and Y directions, various parts of the image are displayed. The movement of the holder is controlled by an electric control means. In accordance with the present invention, a figure such as a map which is similar to the image recorded in the recording medium is provided beside the microfilm reader, and a position detecting means is used in combination therewith to operate said electric control means. The position detecting means includes for instance a detecting pen which has a function to generate a position signal when it is used to point a position in said figure.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view showing an example of a map retrieval system emmbodying the system in accordance with the present invention,

FIG. 2 shows an example of the position signal generating circuit used in the map retrieval system shown in FIG. 1,

FIG. 3 is a perspective view showing the internal structure of a super-microfiche retrieval unit employed in the map retrieval system shown in FIG. 1,

FIG. 4 is a block diagram which shows an example of the X-Y moving means used in the map retrieval system shown in FIG. 1,

FIG. 5 shows an example of the lens selection circuit used in the map retrieval system shown in FIG. 1, and

FIG. 6 is a block diagram which shows an example of the focus adjusting circuit used in the map retrieval system shown FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An example of a retrieval system which embodies this invention is shown in FIG. 1. This system comprises a super-microfiche retrieval unit 10, a position detecting device 11, an operation table 14, and a television monitor 18.

The position detecting device 11 is provided with a map 12 for instance of a town in which rough information such as streets, areas and stations with the name thereof is shown. For example, the map 12 is on a scale of one to fifty thousand.

The super-microfiche retrieval unit includes a super-microfiche 20 (FIG. 2) which bears a detailed map of the town showing individual houses, buildings with the name thereof and other detailed information. The super-microfiche 20 consists of a number of microfiche elements on each of which a corresponding part of a map on a scale of one to one thousand is recorded in a reduced scale of one hundredth. The prepared microfiche elements are connected with each other to constitute the microfiche 20.

The super-microfiche retrieval unit 10 generates an output for displaying detailed information of a part of the map according to a position signal given thereto by the position detecting device 11. When a position signal which represents a certain spot of the map 12 is given to the super-microfiche retrieval unit 10, the unit 10 gives an output which effects to display a detailed map of said certain spot of the map 12. The unit 10 includes an image pick-up tube and an optical projection system for

focusing an image of the map on the tube. The map is moved relative to the tube according to the position signal given thereto.

The position detecting device 11 will be described in detail with reference to FIG. 2.

The position detecting device 11 comprises the map 12, a position signal generating circuit 21 having a tablet 22, and a detecting pen 13 which cooperates with the circuit 21 to generate a position signal. The map 12 is supported on the tablet 22. The tablet 22 includes multipolar stylus electrodes 23 arranged in the form of a lattice. The multiple electrodes comprises X-direction electrodes 28 and Y-direction electrodes 29. An oscillator 24 supplies clock pulses to a binary counter 25, in which the clock pulses is divided. Decoders 26 and 27 are connected between the counter 25 and the X-direction electrodes and the Y-direction electrodes, respectively. The decoders 26 and 27 receive the divided clock pulses from the counter 25 and supply pulses to the X-direction electrodes 28 and Y-direction electrodes 29 progressively.

One output of the detecting pen 13 is connected with the reset terminal R of the counters 25 and reset terminals R of binary counters 30 and 31. When the tip of the detecting pen 13 is depressed in response to action of the pen 13 to point at a portion of the map 12, the pen 13 supplies a reset release signal to the reset terminals R of the counters 25, 30 and 31.

The other output of the detecting pen 13 is connected with the input of an amplifier 32 the output of which is connected with trigger terminals T of flip-flops 33 and 34. A reset terminal R of the flip-flop 33 is connected with the output No. m+1 of the counter 25. A reset terminal R of the flip-flop 34 is connected with the output No. m+1 of the counter 25 via an inverter 35. The outputs of the flip-flops 33 and 34 are connected with one input of AND gates 36 and 37, respectively. The other input of each of the AND gates 36 and 37 is connected with the oscillator 24.

Assuming that the pen 13 points at a position (x, y) on the tablet 22, the operation of the position signal generating circuit 21 will be as follows.

When the tip of the detecting pen 13 is depressed, the detecting pen 13 supplies a reset release signal to the counters 25, 30 and 31. The counter 25 therefore starts counting the pulses from the oscillator 24. The decoder 26 and 27 receive the outputs of the counter 25 and cause the pulses corresponding to the outputs to scan the X-direction and Y-direction electrodes 28 and 29. The outputs of No. 1 to No. m are supplied to the decoder 26 and the outputs of No. m+1 to No. 2m+1 are supplied to the decoder 27.

When the counter 25 supplies the outputs to the decoder 26, the output of No. m+1 is 0, and accordingly the reset terminal R of the flip-flop 33 receives OFF signal. While, the OFF signal is changed to ON signal by the inverter 35 and is supplied to the reset terminal R of the flip-flop 34.

When a pulse is supplied to the electrode No. x of the X-direction electrodes, the detecting pen 13 detects the pulse and the amplifier 32 supplies a detect signal to the trigger terminals T of the flip-flops 33 and 34. The output of the flip-flop 33 outputs ON signal to the one input of the AND gate 36. Therefore, after the pen 13 detects the pulse on the electrode No. x, the pulses from the oscillator 24 pass the gate 36 and are supplied to the counter 30. Since, when the output No. m+1 of the counter 25 outputs ON signal the reset terminal R of the flip-flop 33 turns ON, the output of the flip-flop 33 outputs OFF signal. Accordingly, the AND gate 36 does not give an output. Consequently, the counter 30 counts pulses up to (2^m-x). The output of the counter 30 is supplied to a digital-to-analogue converter 38, which convert the digital output of (2^m-x) to an analogue voltage output Vx.

While, when the output No. m+1 of the counter 25 outputs ON signal, the reset terminal R of the flip-flop 34 receives OFF signal, and therefore the reset of the flip-flop 34 is released. In the same manner as in the case of output Vx, a digital-to-analogue converter 39 outputs a voltage output Vy.

Thus, the position signal generating circuit 21 generates the position signal in the form of voltage (Vx, Vy) corresponding to the position (x, y) on the map 12. The position signal (Vx, Vy) is supplied to the super-microfiche retrieval unit 10.

The super-microfiche retrieval unit 10 will now be described in more detail with reference to FIG. 3. The super-microfiche 20 bearing the detailed map is supported by a holder 40 which is moved in a horizontal plane by an X-Y moving means 41 and 42. The X-Y moving means 41 and 42 are comprised of two servomotors 43, 44, potentiometers 45, 46 and servoamplifiers 47, 48 (FIG. 4). The servomotors 43, 44 are operatively connected with the holder 40 by means of wires 47, 48, respectively.

The servoamplifier 47 compares the position signal Vx from the position signal generating circuit 21 with the voltage of the potentiometer 45 to generate a signal of the difference therebetween. The servomotor 43 is rotated by the signal of the difference from the servoamplifier 43'. The servomotor 43 rotates the potentiometer 44. The servomotor stops when the voltage of the potentiometer 44 coincides with the position signal Vx. Accordingly, the microfiche 20 supported on the holder 40 is moved and positioned at an X-direction position in connection with the position signal Vx from the position signal generating circuit 21. In the same manner, the microfiche 20 is moved and positioned at a Y-direction position in connection with the position signal Vy by a servomotor 44, a potentiometer 46 and a servoamplifier 44'.

When the positioning of the X-direction position and Y-direction position of the microfiche is performed, the central portion of the part of the microfiche 20 corresponding to the position (x, y) of the map 12 is brought into alignment with the optical axis of an optical projection system 49 (FIG. 3) which is located above the microfiche 20. On the operation table 14, an image of the detected spot of the map 20 is displayed in the CRT of the television monitor 18 in enlarged scale. The operation table 14 is provided with a joy stick 17 for giving a position variating signal which comprises an X-direction component and a Y-direction component to be supplied to the X-Y moving means 41 and 42 to vary the position of the microfiche 20 in the super-microfiche retrieval unit 10. This joy stick 17 is conventionally known as a means for giving a position varying signal in a graphic display device in a computer system. The output signal of the joy stick 17 (ΔVx, ΔVy) is added to the output signal of the position signal generating circuit 21 (Vx, Vy), and accordingly the total value ($Vx + \Delta Vx$, $Vy + \Delta Vy$) is put into the X-Y moving means 41 and 42 in the super-microfiche retrieval unit 10 for controlling the position of the super-microfiche 20. Therefore, by moving the joy stick 17 back and forth

and from side to side, the part of the map displayed in the television monitor 18 varies accordingly.

The output projection system 49 includes an illumination light source, a condenser lens and a projection lenses for focusing an image of a part of the map recorded on the microfiche 20 on the face of an image pick-up tube of a television camera 50 to produce an output signal representing the part of the map projected on the image pick-up tube. The projection lens system may be comprised of a plurality of selectable lenses mounted on a lens turret to change the scale of the map to be displayed.

Referring to FIG. 5, a lens selection circuit 51 to be used for a lens turret 52 having four selectable lenses 53 will hereinbelow be described.

A lens changing switch 16 (FIG. 1) is disposed on the operation table and is rotatable to take one of four positions P1, P2, P3 and P4 respectively corresponding to the four lenses 53. When the switch 16 is placed at one of the positions P1, P2, P3 and P4, NAND gates 54 and 55 and a monostable multivibrator 56 receive signals from the switch 16.

Assuming that the switch 16 is placed at the position P1, all of the inputs of the NAND gates 54 and 55 are "1," and accordingly the NAND gates 54 and 55 at the outputs are "0." The two signals "0" are inverted to "1" by means of inverters 57 and 58, respectively. The signals "1" are supplied to inputs D of flip-flops 59 and 60. While, inputs CK of the flip-flops 59 and 60 receive a clock pulse from the monostable multivibrator 56. The flip-flops 59 and 60 output "1" at the terminals Q, and therefore transistors 61 and 62 are turned ON. Consequently, one input of each of exclusive OR gates 63 and 64 is "0." The other inputs of the exclusive OR gates 63 and 64 receive signals from Hall devices 65 and 66. When the Hall devices 65 and 66 detect magnets 67 disposed on a code disc 68 in connection with the positions P1, P2, P3 and P4 of the switch 16, the Hall devices supply a signal "0." The code disc 68 is coaxially connected with the turret 52 and the code disc 68 and the turret 52 are simultaneously rotated by a motor 69.

For example, if the Hall device 65 detects the magnet on the code disc 68, the Hall device 65 supplies a signal "0" to the other input of the exclusive OR gate 63. Since the exclusive OR gate 63 at the one input is "0," the exclusive OR gate 63 at the output is "0." However, if the Hall device 66 does not detect the magnet, the Hall device 66 supplies a signal "1" to the other input of the exclusive OR gate 64. Since the one input of the exclusive OR gate 64 is "0," the exclusive OR gate 64 at the output is "1."

The output of the exclusive OR gate 63 is connected with one input of a NOR gate 70, and the output of the exclusive OR gate 64 is connected with the other input of the NOR gate. When, as mentioned above, the one input is "0" and the other input is "1," the NOR gate 70 at the output is "0." The signal "0" is inverted to "1" by a NAND gate 71, and accordingly a transistor 72 turns ON. When the transistor 72 turns ON, a relay 73 causes the motor 69 to rotate. The motor 69 rotates the turret 52 with the code disc 68.

If the Hall devices 65 and 66 detect the magnets as shown in FIG. 5, the other input of each of the exclusive OR gates is "0." Accordingly, the exclusive OR gates 63 and 64 at the outputs are "0," and then the NOR gate 70 at the output is "1." The signal "1" is inverted to "0" by the NAND gate 71. Therefore, the transistor 72 turns OFF thereby to stop the motor 69. Thus, a lens 53 is selected.

A lens focus adjusting circuit is comprised of a focus adjusting dial 15 provided on the operation table 14, a servoamplifier 82, a servomotor 83 and a potentiometer 84. The servoamplifier 82 compares a voltage output proportional to the rotation of the focus adjusting dial 15 with the voltage of the potentiometer 84 to output a signal indicative of the difference therebetween. The servomotor 83 is rotated by the signal of the difference from the servoamplifier 82 to move at least one lens of the projection lens system. The servomotor 83 is operatively connected with the potentiometer 84, and thus the servomotor 83 rotates the potentiometer 84. The servomotor 83 stops when the voltage of the potentiometer 84 coincides with the voltage from the focus adjusting dial 15. Thus, the focusing position of the projection lens system is adjusted.

When all of the above adjustments are completed, a desired image of the pointed spot of the detailed map recorded on the super-microfiche 20 is displayed in the television monitor 18 in enlarged scale. The operator operates the joy stick 17 to find out an individual house or building in the display map. Since the joy stick 17 is capable of continuously moving a part of the map on the television monitor 18, it is useful for seeing a map along a line such as a street, a river or a railway.

We claim:

1. A graphic information retrieval system comprising in combination:

graphic information recording medium carrying recorded thereon in reduced scale two-dimensionally extending optically readable graphic information,

a display means for displaying a part of said graphic information in enlarged scale, said display means including an optical reading means having an optical axis extending perpendicular to said graphic information and an electric display means which displays the information read by said optical reading means,

means for moving said graphic information recording medium in a plane in which said information two-dimensionally extends upon receipt of an electric position signal to bring various portions of said graphic information into alignment with said optical axis of the optical reading means, and

a position signal generating means including a graphic information carrying means which carries graphic information similar to said graphic information recorded in said recording medium, and detecting means which points at a position on the graphic information and generates an electric position signal representing the pointed at position to be given to said recording medium moving means.

2. A graphic information retrieval system as defined in claim 1 wherein said graphic information is a map and said recording medium is a microfilm on which the map is recorded in reduced scale.

3. A graphic information retrieval system as defined in claim 2 wherein said map recorded on the microfilm is a detailed map showing individual buildings and houses.

4. A graphic information retrieval system as defined in claim 1 wherein said electric display means is a television monitor, and said optical reading means comprises an image pick-up tube electrically connected with said television monitor and an optical projection system which focuses an image of a part of said graphic infor-

mation carried by said recording medium on said image pick-up tube.

5. A graphic information retrieval system as defined in claim 1 wherein said detecting means of said position signal generating means includes a detecting pen which is used to point at a spot on said graphic information carried by said graphic information carrying means in the position signal generating means.

6. A graphic information retrieval system as defined in claim 5 wherein said position signal generating means further includes a joy stick for operating said recording medium moving means to move the recording medium continuously from the position which is determined by said detecting pen.

7. A graphic information retrieval system as defined in claim 1 wherein said display means further includes means for changing the ratio of enlargement of the image displayed by the electric display means.

8. A graphic information retrieval system as defined in claim 7 wherein said ratio changing means comprises a lens turret including a selectable plurality of lenses of different focal length provided in said optical reading means and externally operable electric input means provided on said display means for giving a signal to said lens turret to select one of the lenses.

* * * * *

United States Patent [19]

Taylor et al.

[11] **4,172,264**

[45] **Oct. 23, 1979**

[54] **CONTROL ARRANGEMENT FOR VIDEO SYNCHRONIZERS**

[75] Inventors: **Richard J. Taylor, Barnes; Peter C. Michael, Newbury, both of England**

[73] Assignee: **Quantel Limited, Berkshire, England**

[21] Appl. No.: **873,037**

[22] Filed: **Jan. 27, 1978**

[30] **Foreign Application Priority Data**

Feb. 1, 1977 [GB] United Kingdom 3947/77

[51] **Int. Cl.²** **H04N 5/24**

[52] **U.S. Cl.** **358/185**; 358/183; 358/22

[58] **Field of Search** 358/185, 183, 93, 22

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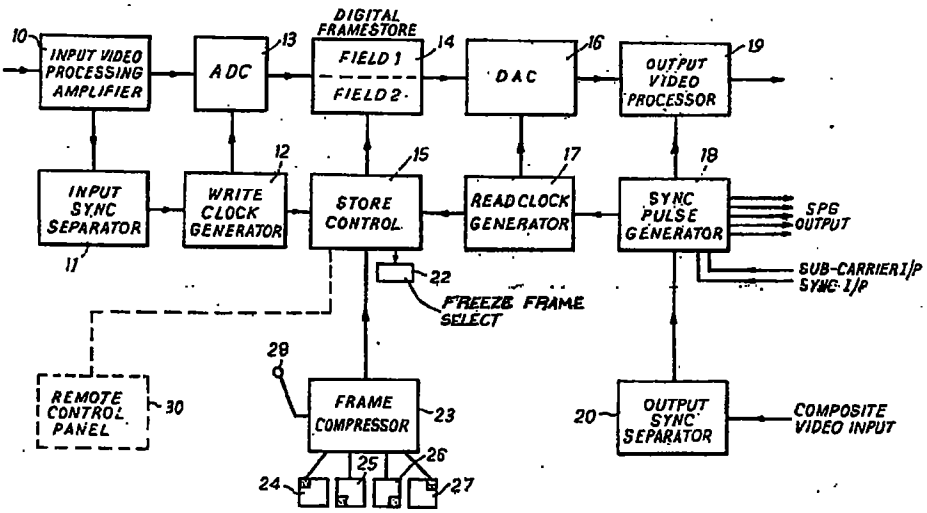
4,016,362	4/1977	Bristow et al.	358/183

Primary Examiner—Howard W. Britton
Assistant Examiner—Edward L. Coles
Attorney, Agent, or Firm—Dowell & Dowell

[57] **ABSTRACT**

A video control arrangement for a synchronizer includes a joystick for moving the T.V. picture in at least one plane to a first selected position. A memory arrangement receives and holds information on the location of the first preselected position which can be recalled later to effect automatic movement of the T.V. picture to this preselected position.

10 Claims, 5 Drawing Figures



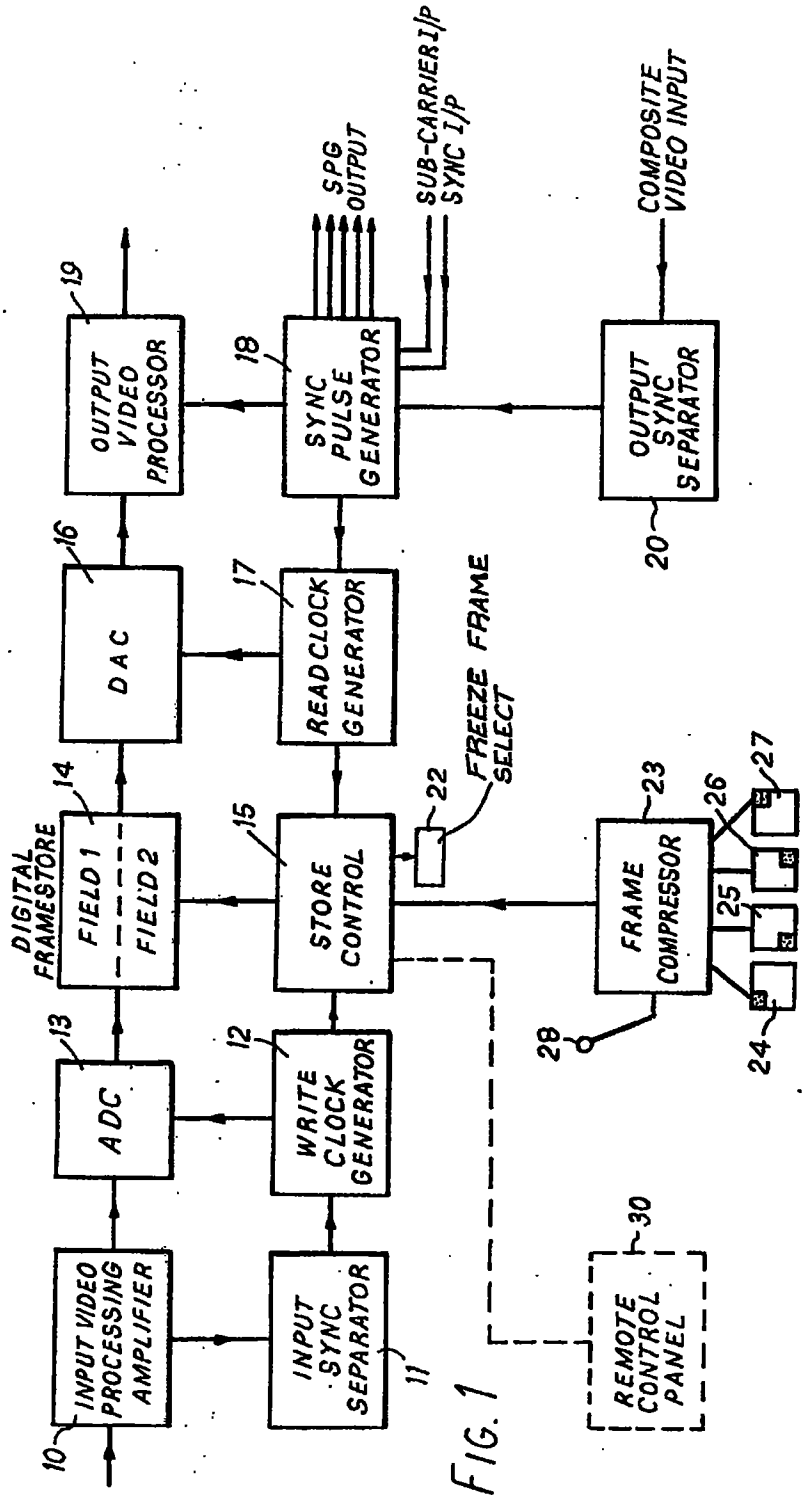

SPG OUTPUT
SUB-CARRIER I/P SYNC I/P
COMPOSITE VIDEO INPUT
OUTPUT VIDEO PROCESSOR
SYNC PULSE GENERATOR
OUTPUT SYNC SEPARATOR
DAC
READ CLOCK GENERATOR
FREEZE FRAME SELECT
DIGITAL FRAMESTORE
FIELD 1
FIELD 2
STORE CONTROL
FRAME COMPRESSOR
ADC
WRITE CLOCK GENERATOR
INPUT VIDEO PROCESSING AMPLIFIER
INPUT SYNC SEPARATOR
REMOTE CONTROL PANEL
10
11
12
13
14
15
16
17
18
19
20
22
23
24
25
26
27
28
30

FIG. 1

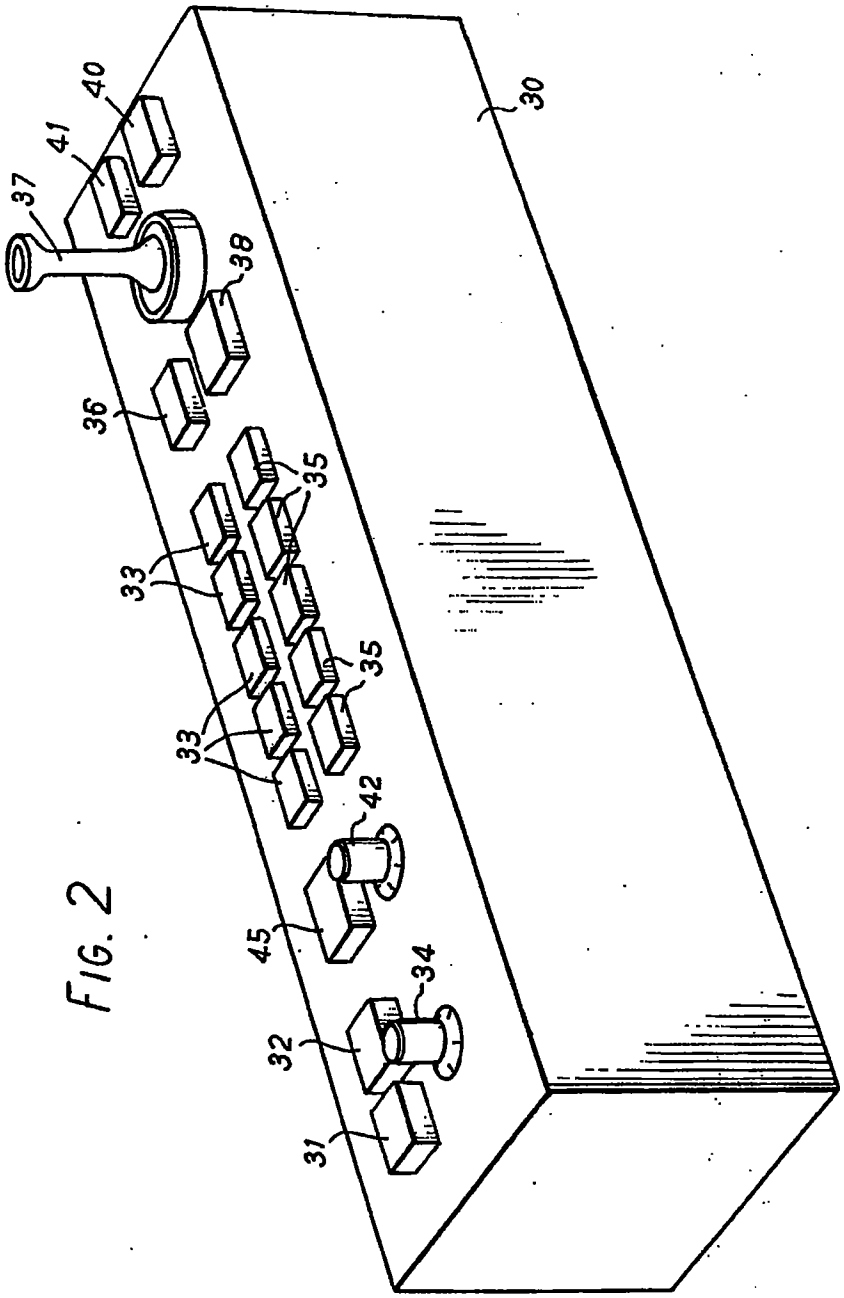


FIG. 2

FIG. 3

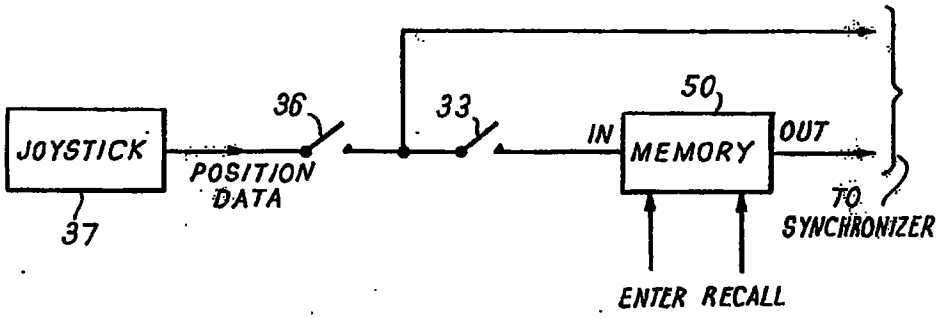
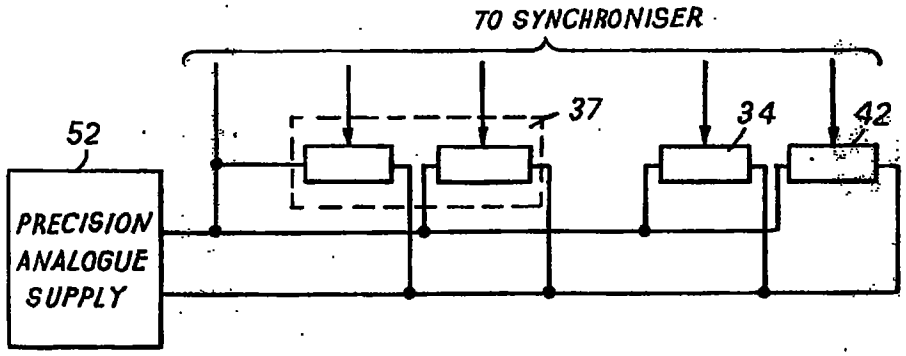

JOYSTICK
37
36
POSITION DATA
33
50
IN
MEMORY
OUT
TO SYNCHRONIZER
ENTER
RECALL

FIG. 4


TO SYNCHRONISER
52
PRECISION ANALOGUE SUPPLY
37
34
42

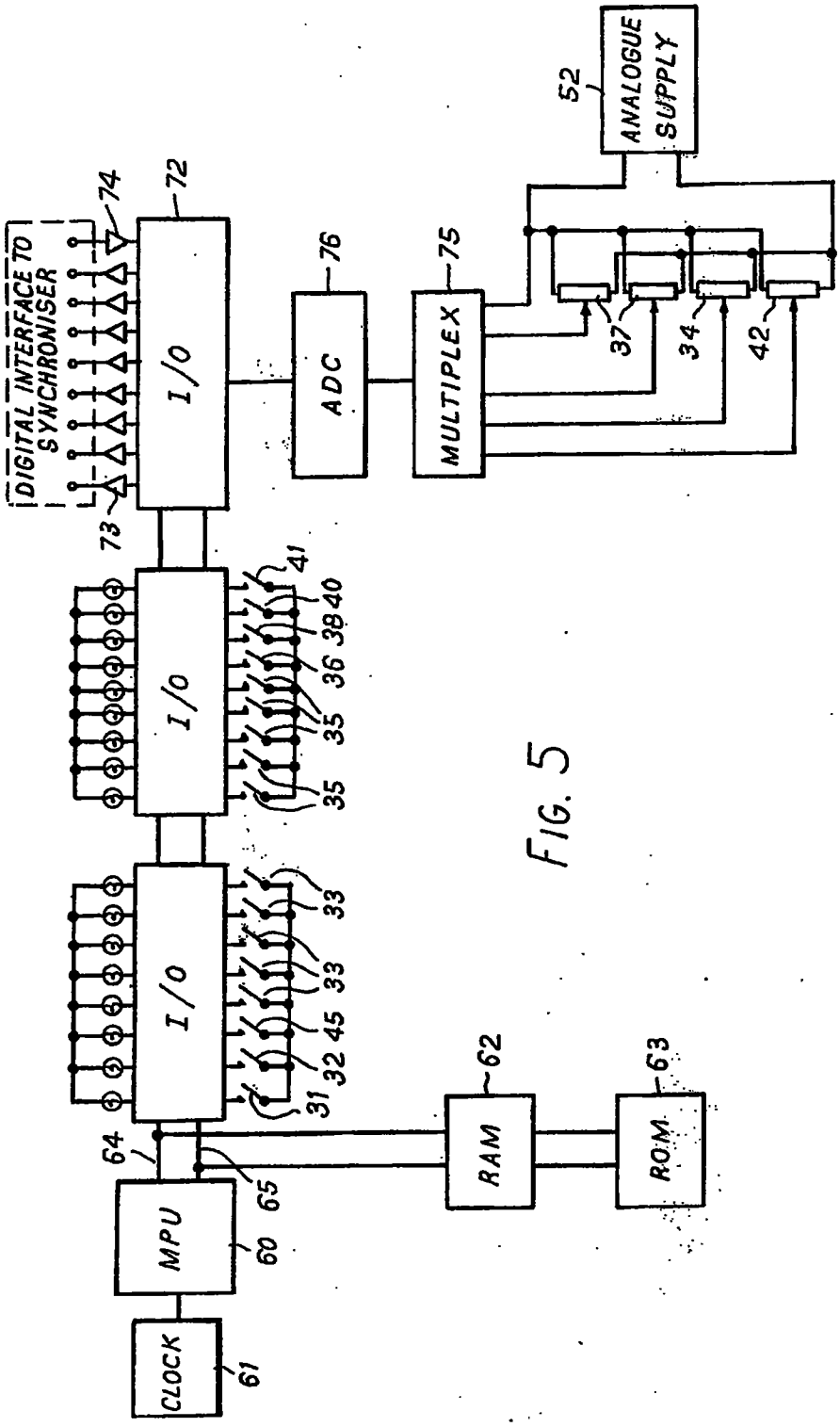

ANALOGUE SUPPLY
52
DIGITAL INTERFACE TO SYNCHRONISER
74
72
I/O
76
ADC
75
MULTIPLEX
37
34
42
73
41
40
38
36
35
35
I/O
33
33
45
32
31
I/O
62
RAM
63
ROM
64
65
MPU
60
CLOCK
61

FIG. 5

CONTROL ARRANGEMENT FOR VIDEO SYNCHRONIZERS

BACKGROUND TO THE INVENTION

The invention relates to synchronisers and more specifically to a video control arrangement for synchronisers.

Framestore synchronisers (e.g. Quantel DFS 3000) are now well known in various parts of the television world for example North America and Europe (see also for example British patent application Ser. No. 6588/76 or U.S. patent application Ser. No. 769,615, now U.S. Pat. No. 4,101,939).

In the DFS 3000, the synchroniser has the facility of picture freeze within the frame store (see also for example British patent application Ser. No. 6585/76 or U.S. patent application Ser. No. 764,148). The facility of frame compression to produce quarter size pictures is provided (see also for example British patent application Ser. No. 21024/76 or U.S. patent application Ser. No. 798,513, now U.S. Pat. No. 4,152,799). Movement of the compressed picture may be effected by means of a joystick control.

OBJECT OF THE INVENTION

An object of the invention is to provide additional control facilities for the synchroniser which may be provided at a position remote from the synchroniser.

SUMMARY OF THE INVENTION

According to the invention there is provided a video control arrangement for a synchroniser comprising; positioning means for moving the position of a T.V. picture in at least one plane to a first selected position; memory means for receiving and holding information on the location of said first preselected position and for recalling the location of this preselected position.

BRIEF DESCRIPTION OF DRAWINGS

The invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 shows the known synchroniser to which the control arrangement of the invention can be attached;

FIG. 2 shows typical manual controls of the unit;

FIG. 3 shows one arrangement for presetting and recalling the image position in the control arrangement of the invention;

FIG. 4 shows the joystick, undate interval and transition time controls; and

FIG. 5 shows an arrangement including a microprocessor for realising the functions of the FIG. 2 arrangement.

DESCRIPTION OF PREFERRED EMBODIMENTS

The arrangement for the known DFS 3000 synchroniser is shown in FIG. 1. A video input is received by processing amplifier 10 which feeds sync separator 11 controlling a write clock generator 12. The clock generator output is received by an analogue to digital converter (ADC) 13 which converts the video signal to digital form prior to storage in a frame store 14. The write clock generator 12 also has an output received by a store control 15 which controls the operation sequence of the store 14. The store output is received by digital to analogue converter 16 which is under the

control of clocks from read clock generator 17 receiving sync pulses from sync pulse generator 18. The analogue output of converter 16 is received by output processor 19 which provides the composite video output of the synchroniser. The sync pulse generator 18 is controlled by means of externally generated sub carrier and sync inputs directly or via an output sync separator 20 which receives a composite video signal.

The store control of the synchroniser has the facility of freezing the picture within the frame store (see also for example British patent application Ser. No. 6585/76 or U.S. patent application Ser. No. 764,148). The synchroniser has the facility of frame compression by only storing selected picture point samples so that if every other picture point is not stored (in both horizontal and vertical directions) a quarter sized picture is produced (see also for example British patent application Ser. No. 21024/76 or U.S. patent application Ser. No. 795,513). The frame compressor 23 allows this compressed picture to be stored in any one of four quadrants by means of selectors 24–27 which control the picture point counter addresses. In addition a joystick control 28 is provided which allows the quarter size picture to be moved anywhere within the normal picture frame area by defining the pertinent varying address as the stick is moved.

The remote control arrangement 30 of the invention is connectable to the store control of the known synchroniser to provide the standard functions just described together with additional functions at a position remote from the synchroniser (e.g. in the studio mixer) by a distance of up to several hundred feet if required.

A typical layout for the manual controls of unit 30 is shown if FIG. 2.

A frame freeze button 31 is provided for freezing captions. A field freeze button 32 is provided for stopping fast moving objects on the picture. In addition an update control 34 is provided which allows a variable update interval to be selected by the producer to automatically update the frozen picture between a rate of say once per second to infinity (i.e. hold).

Five preselect buttons 33 are provided for the compressed picture position. These buttons not only select the compressed function when depressed but also have the capability to memorize positions previously chosen at the beginning of the T.V. programme so that these can be recalled by the producer when required and thus allow rehearsal of a programme prior to transmission in the confidence that when he moves from event to event on air the chosen sequence will be faithfully reproduced. The chosen position is recalled merely by pressing the appropriate button and the cancellation of this effect to normal size and position is effected by depressing the appropriate button once again.

The memory facility is actuated during rehearsal in conjunction with 'live' button 36 and joystick positioner 37. The picture position is determined by varying the joystick 37 with live button 36 depressed. If one of the preselect buttons 33 is also depressed the position of the joystick is remembered for recall later.

It is also possible to move and memorise a full frame of video by means of joystick 37 by depressing live button 38 and one of the five preset buttons 35 in a similar way to compressed frame. By only depressing the live button 36 or 38 it is possible to rely only on live position control without using the preselect facilities of buttons 33 and 35. Two buttons 40 and 41 are provided

to switch off respectively the X and Y axes of the joystick to allow a smooth live single dimentional pan or tilt.

A transition time control **42** is provided to allow the producer to select the rate of pan or tilt from one preselected position to another. The rate can be varied typically from instantaneous to a time of several seconds. Alternatively the rate of velocity may be varied.

An auto key button **45** is also provided. The auto key facility is provided to make life easier for the camera man. The control is able to measure the centre of the chroma key area when the chroma key signal is fed into the synchroniser and computes the appropriate position for the compressed image to be centred over the key signal so that if the camera pans the compressed image automatically follows. Thus auto key is used where a chroma key signal is being fed to the synchroniser and the producer has approximately centred a compressed picture over the key area using one of the five preselector buttons. Pressing the auto key button **45** will ensure that the compressed image is automatically centred over the key area even if this key area should move. The various buttons described above may incorporate a lamp to clearly indicate that a button is depressed.

A circuit arrangement suitable for the compressed picture position presetting of FIG. **2** is shown in FIG. **3**.

The position data from joystick control **37** can be passed via live switch **36** directly to the synchroniser so that the joystick operates in the known live mode. If however the preset switch **33** is closed, the position data is fed into a memory **50** where it is stored. When the position data is recalled this is passed to the synchroniser to cause movement to this position to be implemented. Enter and recall for the memory can be arranged to be actuated respectively with the preset switch **33**. The memory may be analogue or digital depending on the type of output provided by the joystick and the synchroniser input. To provide the requirements of the FIG. **2** arrangement five such switches **33** and memories **50** would be required for the compressed picture position and five similar arrangements for the full frame position.

Although such a system can be constructed solely from known hardware elements it is more convenient to use a microprocessor system with related circuitry to effect the above arrangements and such a system will be described later with reference to FIG. **5**.

FIG. **4** shows analogue arrangements for the joystick, update intervals and transition time controls.

Joystick control **37** comprises two variable resistors one for vertical and horizontal position respectively. Update interval control **34** comprises one variable resistor which controls a simple timing circuit (not shown) that operates on the freeze lines. The transition time or velocity control **42** also comprises a variable resistor and this operates a simple ramp circuit (not shown) that constrains the rate at which the voltage that controls the position is allowed to change from one location to another. The controls receive a voltage from a precision analogue supply **52** which may be in the control unit or taken from the synchroniser.

The use of a microprocessor system to effect the above control functions is shown in FIG. **5**. The heart of the system is a microprocessor unit (MPU) **60** (e.g. Motorola 6800). A random access memory (RAM) **62** (e.g. Motorola 6810) is connected to the MPU which acts as working space for the programme, which processor programme is contained in read only memory (ROM) **63** (e.g. Motorola 6830). The memories are connected to the MPU by common address bus **64** and common data bus **65**. The various switches **31, 32, 45, 33, 36, 35, 38** (and their associated lamps) are connected to I/O circuits **68,69** (peripheral interface adaptors e.g. type 6820). These interface adaptors are connected to the MPU via common buses **64,65**. An additional adaptor **72** is provided together with line drivers **73** and line receivers **74** to provide the necessary digital interfacing to and from the synchroniser.

The analog controls of FIG. **4** are now included in FIG. **5** and are connected to the microprocessor system via a multiplexer **75** and an analogue to digital converter (ADC) **76** which converts the analogue signal to digital form to allow purely digital interfacing to and from the synchroniser of all required functions.

The programming of microprocessors is well known and so will not be described in detail.

The microprocessor programme is written in such a way that the pushing of the relevent selector button and moving the joystick effects memorising of that location for the compressed or full frame picture to allow the picture to move from one position to another at a rate chosen by the variable transition control.

Another advantage of the microprocessor system is that the programme can be written in such a manner that non-linear movement of the picture from one stored location to another is possible. In this way picture movement similar to that achieved by the camera man when having to accelerate and decelerate the mass of his camera can be obtained thereby creating greater realism.

The variable transition control is achieved by causing the programme to incrementally count from one location to another. Clearly if this count is fed as the address of the picture to the synchroniser, smooth movement between, instead of an instantanious jump from one location to another, is obtained. The concept of non-linear movement can be realised by producing a non-linear transfer function in the programme space so that linear vectors demanded by the main programme are 'bent' to move slower at the start and finish of the process.

We claim:

1. A video control arrangement for a synchroniser comprising:

picture positioning means for moving the relative frame position of a T.V. picture to a first selected position;

memory means for receiving and holding information on the location of said first preselected position and for recalling the location of this preselected position.

2. A control arrangement according to claim **1** wherein said memory means is for holding information on a full size picture.

3. A control arrangement according to claim **1** wherein said memory means is for holding information on a compressed picture.

4. A control arrangement according to claim **1** wherein auto key means are provided to ensure automatic centering of the position of the T.V. image.

5. A control arrangement according to claim **1** wherein the control arrangement can be provided remote from the synchroniser via coupling means.

6. A control arrangement according to claim **1**, wherein a plurality of memory means are provided to receive and hold information on a plurality of preselected positions.

7. A control arrangement according to claim 6 wherein transition means are provided to effect movement of said picture from one preselected position to another in a predetermined period.

8. A control arrangement according to claim 7 wherein said transition means are variable to provide movement over a predetermined period range.

9. A control arrangement according to claim 1 wherein freeze control means are provided to freeze the picture for a predetermined period and wherein update means are provided to update the frozen picture after a predetermined period.

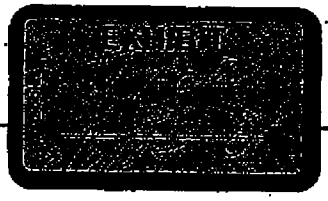
10. A control arrangement according to claim 9 wherein the update means is variable to provide a variable update period.

* * * * *

MCI/QUANTEL

Micro Consultants, Inc., P.O. Box 50810, Palo Alto, California 94303, Phone: (415) 856-6226, Telex: 334420

MARCH 1, 1980



NEWS

The DLS 6000 Digital Library System - A Preliminary Description

Introduction

The revolutionary Quantel DLS 6000 Digital Library System represents a new generation of still stores. The system permits not only significant improvements in basic performance over existing techniques, but also allows several unique capabilities to be included that make the unit a complete production tool.

Also included is a novel off-line storage technique that permits a virtually unlimited library. (The off-line system will not be described in this paper but can be seen at the NAB in Las Vegas.)

The Basic Philosophy

The idea of storing television stills on a computer disc in digital form rather than as conventional 35mm slides is not new. The advantages of this approach include high integrity of information, very simple generation of stills, ease of program compilation with greater immediacy, lower running and maintenance costs, better security, and easier management of a central library.

However, existing equipment is bulky and has no production facilities to allow simple integration of stills into a program with the flexibility increasingly being demanded by production staff.

The Quantel DLS 6000 transcends both these obstacles, achieving small size through high packing density on disc, and offering all the production facilities required by the modern program maker.

The philosophy behind the DLS 6000 is the marriage of solid state framestore techniques with standard computer disc technology. The use of completely unmodified computer disc systems gives high reliability and low cost -- particularly important if the machine is to be readily adopted by the broadcast industry, and critical if the unit is to be used in outside broadcast vans.

L001377

The disc technology used is the IBM-developed Winchester system. This is the latest very high density, low cost disc system now adopted as standard by the computer industry and available from several manufacturers. Capacities of up to 160 M bits are possible in units less than 8 inches tall.

However, if standard computer disc systems are used, some way has to be found to overcome the fact that typical data rates on disc are only 8 M bits/sec as opposed to greater than 100 M bits/sec for real time digital television. The solution lies in the provision of solid state framestores used as buffers before and after the disc.

The computer disc-based still store then essentially comprises the disc itself and a solid state framestore able to operate at both real time video rates and disc rates. Recording is achieved by capturing the picture at real time and then writing it to disc more slowly. Replay is gained by the same process in reverse, the information being transferred from disc to the framestore at 8 M bits/sec and then displayed to the outside world at full video rate.

Although only a single framestore and the disc are required, considerable improvements can be made to the ease with which the machine can be used if more than one framestore is included. The DLS 6000 contains three.

The basic task of the system is to replay the correct picture from the disc store. However, the usefulness of the system can be greatly enhanced if, at the same time, the size and position of the replayed picture can be defined in accordance with the requirements of the rest of the production.

Special circuits in the DLS 6000 allow this function to be available for multiple images to allow montages to be produced. The addition of a multiple border facility completes the full production package.

Features of the DLS 6000

High Capacity

Up to 340 pictures can be stored on one disc drive and multiple disc operation is allowed giving, say, 3400 pictures randomly accessible from 10 discs. The number of disc drives allowed is unlimited, but most users requiring very large library storage will make use of a novel off-line back-up store.

Small Size

The high capacity of the DLS 6000 does not preclude its use in outside broadcast vans since the device is remarkably small - just 7" for the disc unit and 10½" for the DLS 6000 unit itself.

High Fidelity

The Quantel tradition of high fidelity is maintained in the quality of the images of the DLS 6000 at all times whether modified in size

or not. At all sizes and shapes the unit displays virtually transparent image quality.

High Change Rate

Pictures can be changed at a rate of two per second with complete random access; thus, no cache memory of the day's program requirement has to be prepared.

On-Air Picture Change

Although the change rate is limited to two per second, the additional framestore circuitry in the DLS 6000 allows vertical interval switching between pictures. Thus, the switch is instantaneous.

On-Air Transitions

A mix/effect bus can be eliminated by utilizing the digital transitions available in the DLS 6000. Changes between one picture and the next can be by means of a simple cut, a programmable dissolve, or even a wipe.

Picture Reposition

The output picture of the DLS 6000 can be repositioned by the technical director at will.

Picture Compression

The DLS 6000 will reproduce the stored image at any size from normal (full size) down to virtually zero size. This feature, together with the reposition system, allows the technical director to define the exact size and position of the reproduced still to suit his production without resorting to any other digital effects device.

Picture Enlargement

The image can be enlarged up to two times to allow selection of a chosen portion of a still.

Variable Aspect Ratio

The aspect ratio of the image can be varied away from the standard 4 x 3 to any rectangular shape.

Multiple Picture Handling

The DLS 6000 is capable of reproducing as many pictures as are wanted at the same time. This capability is clearly an adjunct to those of compression and repositioning and is used either to show at the same time a number of participants in a discussion or event, or even to build up a complete montage of images. The pictures can be recalled

from disc one at a time to show the viewer the build up, or simultaneously so that only the finished composite is seen.

The Borders

The DLS 6000 includes its own border generator capable of changes in hue, saturation, luminance and width. This is applicable to all pictures being shown, although different images can have quite different border parameters at the same time.

The border generator also includes a background or matte generator, further releasing the switcher for other functions.

Multiple Outputs

Three outputs are available with the DLS 6000, two program and one preview. Internally generated transitions are possible with both program outputs or they can be used together to utilize more exotic wipes in a switcher. The DLS 6000 generates keys that match the pictures at all times.

Preview

The DLS 6000 has its own preview output which can be operated without effecting the on-air program or transitions. The preview allows the varying size or position of images to be chosen by means of cross-wire cursors controlled by joysticks. It also contains a unique feature for fast viewing called "BROWSE".

"BROWSE"

"BROWSE" provides the ability to look through the contents of the disc by displaying 25 images at one time and slowly moving them down the screen. This rolling list of pictures allows easy viewing to find the desired frame or alternatively permits the showing of pre-chosen slides waiting in the 'stack' for display on a program.

On-Air Editing

On-air display or transition is unaffected by preview contents; similarly the unit allows the capture and recording of incoming material during on-air display or transitions. This feature is essential if the unit is to be used to its fullest extent in the news studio.

Asynchronous Operation

The input of the DLS 6000 can handle asynchronous information to allow stills to be captured from incoming ENG material.

Graphics Handling

The DLS 6000 is capable of keying stored graphics over displayed images, releasing the switcher from this function. Graphics may have their size

and position defined independently of picture information; in this way, perfect readability is assured for all sizes of titled images.

Digital Re-recording of Composite Pictures

Composite pictures created on the preview monitor can either be stored as control parameters to ensure recall on demand on the program outputs, or they can be re-recorded back onto disc as a complete new picture at an individual location.

Editing System

Complete sequences of commands to the DLS 6000 can be set up and stored to allow simple single-button operation during program time. The editing system does, however, allow simple addition or deletion of items to ensure ease of operation in a fast-moving news broadcast.

The inclusion of a DEC LSI-11 minicomputer as the host processor for the system allows the simple addition of standard computer peripherals at a later date to accomodate even more powerful editing systems.

Control Delegation

The control of the DLS 6000 can be timeshared between several stations including, during a live broadcast, separate preparation and replay panels. This permits the technical director to remain divorced from the choice of stills created from incoming ENG material.

Future Expansion

As with all Quantel products, the DLS 6000 has been designed to allow future expansion by the retrofitting of options. The first of these is likely to be an increase in storage capacity allowing up to 700 pictures per disc drive.

The System

The previous section defines the DLS 6000 as requiring an input store to capture video information, two program output stores for displaying the output, and one preview output store to permit viewing of disc information without interference with program output. These facilities readily define the block diagram of the system, as shown in Figure 1.

The recording chain is shown at the top of Figure 1. Input video enters the system and is immediately converted into digital format and passed to a framestore at full video data rate. This input framestore acts as a freeze frame device and allows the user to select still pictures from the incoming live video. For convenience, the link from the output of this store to the preview output from the DLS 6000 has not been shown, but in reality the video follows this path allowing the user to observe the incoming picture at all times, whether live or frozen.

Once the chosen image has been frozen in the framestore it is read out

from the store at disc data rate via a data processor section to further reduce data rates, and then via the disc formatter to block the information suitable for writing on to the disc.

The disc itself is a latest generation sealed Winchester-type drive with high packing density. The heads are of the flying type but the construction of the disc eliminates the need to have expensive and unreliable head retraction mechanism; the heads actually land on the disc surface when the platter is not in motion. The disc data rate allows a picture to be generated in 0.5 seconds. The total package is highly reliable and rugged, and includes parity check circuitry for optimum data integrity.

The replay chain, shown at the bottom of Figure 1, is obviously more complex than record due to the increased number of framestores and program output facilities. Data from the disc passes through a disc re-formatter where the information is sorted out from its blocks and then onto the data processor where it is unpacked. The information is passed to one of the three framestores and it is at this point the size change mechanism operates. If the information is routed via the preview store then no other processing is done other than reading it out of the store at full video rate into a DAC and onto the display via a proc amp. If the data is fed to one of the program stores then it is subsequently passed to a digital combiner assembly that performs the appropriate wipe, cut, or dissolve functions. Also the combiner copes with the addition of borders or the keying of caption information over pictures or colored matte.

For convenience one framestore is shared between the video input facility and the preview output. Not shown in Figure 1 is the host DEC LSI-11 mini-computer that controls the whole machine and is responsible for all housekeeping tasks, the operation of the control panel, and the editing system.

The Control System

The philosophy behind the control system for the DLS 6000 is based on the concept of Pictures, Slides and Groups.

A picture is defined as an image on disc with a number allocated to it at the time of recording. A picture is normally recorded on disc at full size to give maximum flexibility on replay.

A slide is a picture on replay that has the parameters of size, postion, transition type, time, etc. allocated to it. The number of a slide need not be the same as the number of the picture that the slide depicts.

A group is a collection of up to ten slides.

The importance of these three definitions will become clear when the display system and control panel are described, but the important thing to remember is that, with this machine, defining a picture merely by a number is insufficient due to the extra facilities available. Therefore, both the picture and what is to be done with it must be defined before

displaying on the program output.

The Computer Display

The extra degrees of freedom made available by the DLS 6000 production features makes it necessary that, at both the preparation time and the program time, the operator always has a clear picture of exact machine status.

In order to give the user this clear indication of the situation, a video display system has been added to the host computer. It is via this display system that all setting of parameters is achieved.

The computer display output is added to the preview output and shares the preview screen.

There are three types of computer display available to the user Edit, Ident and Menu. A cursor display is added to all these to allow the size and shape of images to be defined.

The Cursor

Four lines on the preview monitor define the top, bottom, and two sides of the picture. Whatever size, position and shape is enclosed by the four lines is filled by the picture called from the disc.

In the case of expansion, the area inside the cursors defines the portion of the original picture (taken as full screen) that will be displayed.

The cursor is not available on the program outputs.

The Edit Display

A typical example of the Edit Display is shown in Figure 2. Note that the slide number is independent of the picture number, as described earlier. Size and position parameters are set with the joysticks on the control panel; the legend on the display merely reminds the user of the particular condition set.

Border has to be defined as on or off. If on, then again the parameters are set from the control panel.

Transitions between one slide and the next can be defined as dissolves, cuts, wipes, or supers. In the case of supers, slides are super-imposed on one another to create montages of images.

Transition times are defined under the cue headings. Normally, the advance from one slide to the next has to be initiated by the start button or the control panel; unused locations are skipped. Instant headings are usually used with super-imposed pictures but alternatively, the 'start' initialization can be used in which case the montage is built up before the viewers' eyes.

'Ext' denotes that the system should wait for an external cue from another device such as a computer editor.

Locations on the display that do not have any entries are 'DON'T CARE' cases. In these circumstances, the computer will define the last parameter taken. In this way, if at the beginning of a Group, size and position are defined but all other slides leave this column blank, then all subsequent pictures will be displayed at the same size and position.

The Ident Display

The "BROWSE" mode for the DLS 6000 allows the user to look through the contents of the disc 25 pictures at a time on the preview monitor. The 25 pictures move slowly down the screen with new rows of 5 being added as the first 5 fall off the bottom of the screen. This feature gives the viewer the electronic replacement for holding a 35 mm slide carrier up to the light.

The ident display overlays the true picture number on the "BROWSE" display so that the various chosen pictures may be easily identified.

The Menu Display

The Menu display is a special option that allows selection of modes of use of the machine.

The Control Panel

Figure 3 shows the control panel for the DLS 6000, which occupies 8" x 4" of panel space.

The long rectangular area towards the top of the panel is an alpha-numeric display that is used by the machine to indicate its status and allow a degree of conversation with the user.

The joysticks at the top right are used to change the size, shape, and position of the displayed image and the keypad underneath is the means by which numbers are assigned to pictures, slides, or groups, and through which all parameters are entered into the machine.

The 'clear' button cancels the action of the joysticks, ensuring that the image is normal size and position.

FREEZE is self explanatory except that it should be remembered that this results in an image being frozen in the input store and not transferred to the disc. Transfer is achieved with the RECORD button into a picture location defined by a keypad number. The FRAME/FIELD button decides whether the picture is transferred at frame or field resolution. ERASE removes a picture from disc, again defined by keypad numbers.

GROUP, START, and STOP are associated with the editing system and control couplings of pictures that can be called up, not by their real

numbers which may be scattered over large areas, but by simple order in a sequence. This will be described more fully later.

The two buttons △ and ▽ move a cursor arrow up and down the computer display to select various functions.

SELECT controls which of the various possible types of computer display is being used, and CHANGE operates on some of the heading of the computer display to change options in sequence.

PICTURE is used to denote a demand for a location on disc to be accessed.

Across the top of the panel are four toggle switches used to control the parameters of borders or matte.

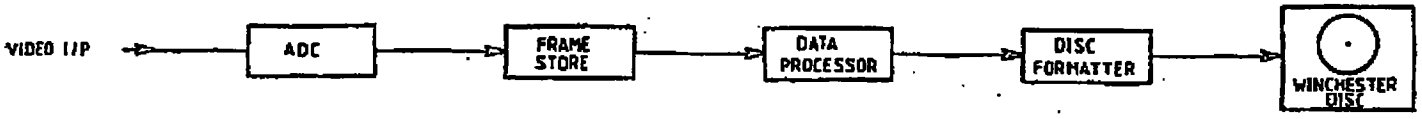
Timesharing Use

The DLS 6000 is designed to be capable of single or two-person operation; thus two control panels may access the machine simultaneously.

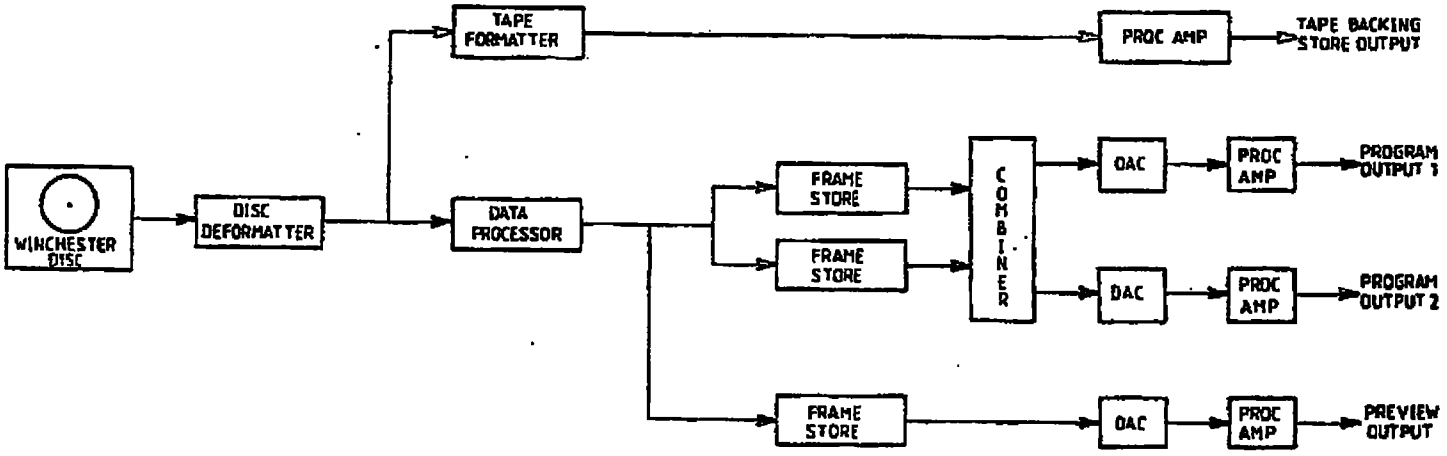
The best way of describing this function is a typical long news program in which the pictures for the end of the show have not been decided upon prior to air time. In these circumstances, the technical director will have a control panel in front of him associated with the switcher, while a production assistant or 'composer' will also have a control panel. Both are identical, but one is used virtually always for replay (the TD) and the other for record (the 'composer').

The TD will merely move from slide to slide within a group without necessarily worrying about choosing the content of the slide. A Group will be assigned to a particular story or item in the newscast. If the content of the story changes, then the 'composer' will modify the pictures accordingly; if stories are inserted or deleted as the program develops, then the TD merely has to be told which is the group containing the story being covered. At all times the 'composer' can be busy building the material while the program outputs of the machine are on-air.

The timesharing system also allows the disc system to be switched from studio to studio if desired.



THE RECORDING CHAIN



THE REPLAY CHAIN.

FIGURE 1. BLOCK DIAGRAM OF THE OLS 6000.

L001386

AX022128

GROUP 123

SLIDE	PICTURE	SIZE & POSITION	BORDER	TRANSITION	CUE
0	23	NORMAL	ON	DISSOLVE	20
1	18	COMPRESS	OFF	CUT	
2	14	ENLARGE		WIPE	10
3					
4	36	COMPRESS		SUPER	INSTANT
5	100	COMPRESS		SUPER	
6	23	COMPRESS		CUT	
7					
8	11	NORNAL		CUT	EAT
9	10				

NEXT GROUP 138

FIGURE 2. TYPICAL EDIT DISPLAY FOR DLS 6000

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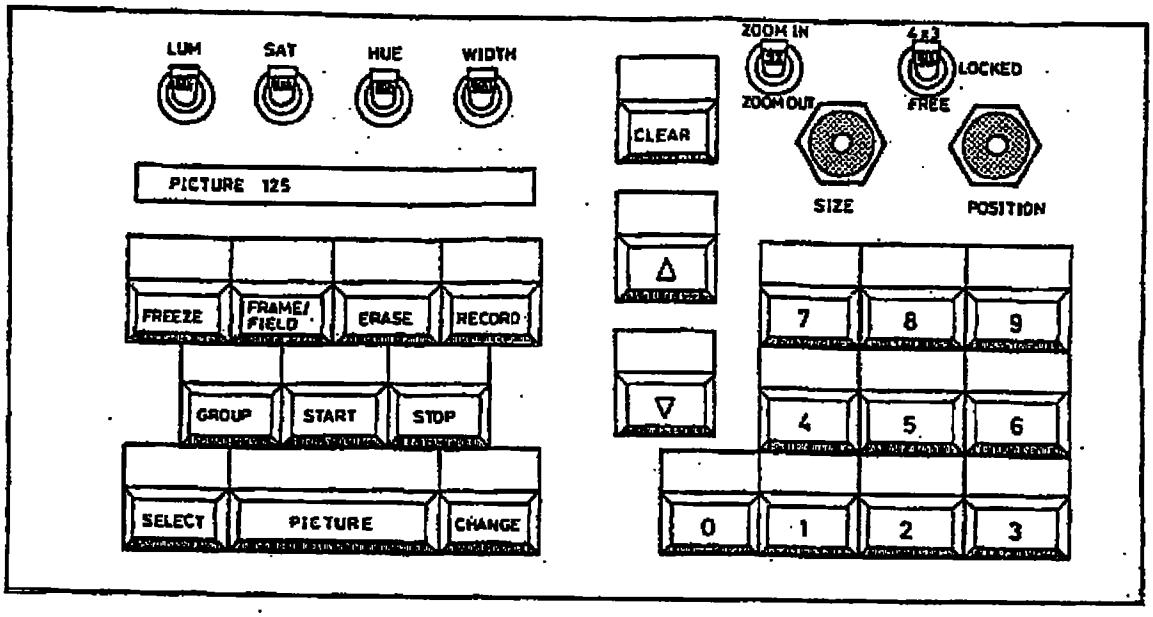


FIGURE 3. DLS 6000 CONTROL PANEL.

L001388

AX022130

United States Patent [19]

Taylor et al.

[11] **4,302,776**

[45] **Nov. 24, 1981**

[54] **DIGITAL STILL PICTURE STORAGE SYSTEM WITH SIZE CHANGE FACILITY**

[75] Inventors: **Richard J. Taylor**, London, England; **Phillip P. Bennett**, Foster City, Calif.

[73] Assignee: **Micro Consultants Limited**, Berkshire, England

[21] Appl. No.: **128,789**

[22] Filed: **Mar. 10, 1980**

[30] **Foreign Application Priority Data**

Mar. 22, 1979 [GB] United Kingdom 10113/79
Nov. 9, 1979 [GB] United Kingdom 38847/79

[51] Int. Cl.³ H04N 5/76; H04N 5/92
[52] U.S. Cl. 358/160; 358/180; 358/138; 360/9; 360/33; 360/39
[58] Field of Search 358/160, 180, 133, 138; 360/33, 39, 8, 9

[56] **References Cited**

U.S. PATENT DOCUMENTS

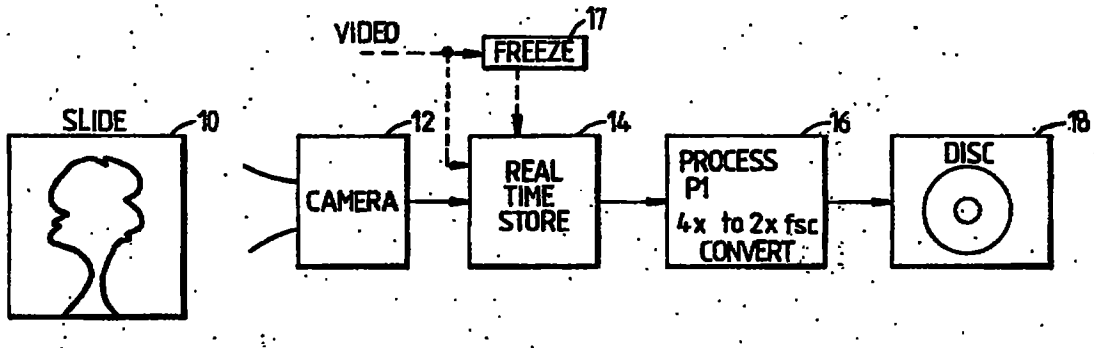
4,204,227 5/1980 Gurley 358/138

Primary Examiner—Robert L. Richardson
Attorney, Agent, or Firm—Dowell & Dowell

[57] **ABSTRACT**

A digital picture storage system with various facilities including size change. The system includes real time frame storage and a non-real time store expediently provided as disc storage. The size change mechanism has access to the data in the non-real time domain to allow size change techniques to be used which are more readily realizable.

34 Claims, 21 Drawing Figures



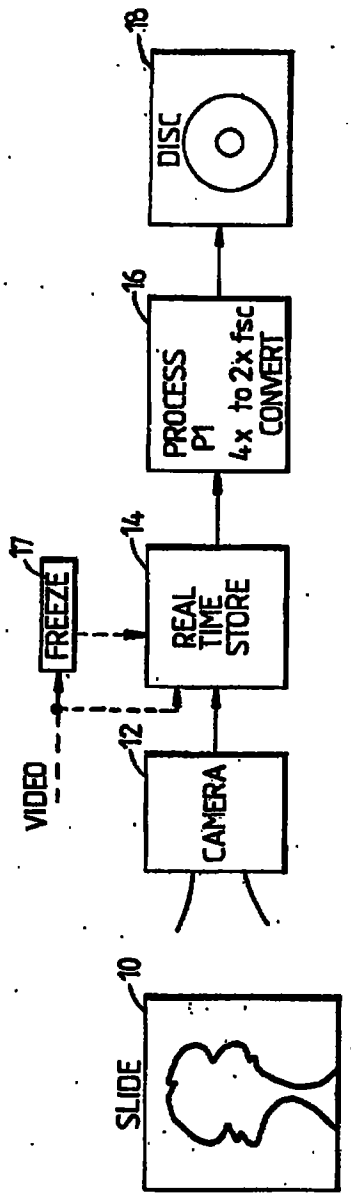

SLIDE
10
CAMERA
12
VIDEO
FREEZE
17
REAL TIME STORE
14
PROCESS P1 4x to 2x fsc CONVERT
16
DISC
18

Fig. 1

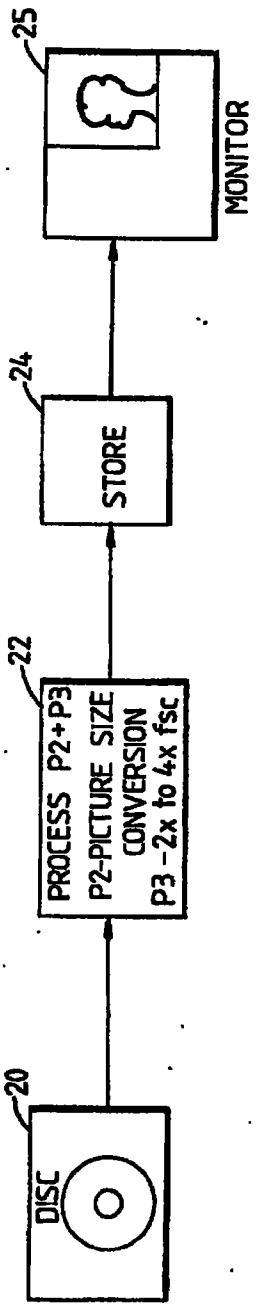

DISC
20
PROCESS P2+P3 P2-PICTURE SIZE CONVERSION P3 -2x to 4x fsc
22
STORE
24
MONITOR
25

Fig. 2

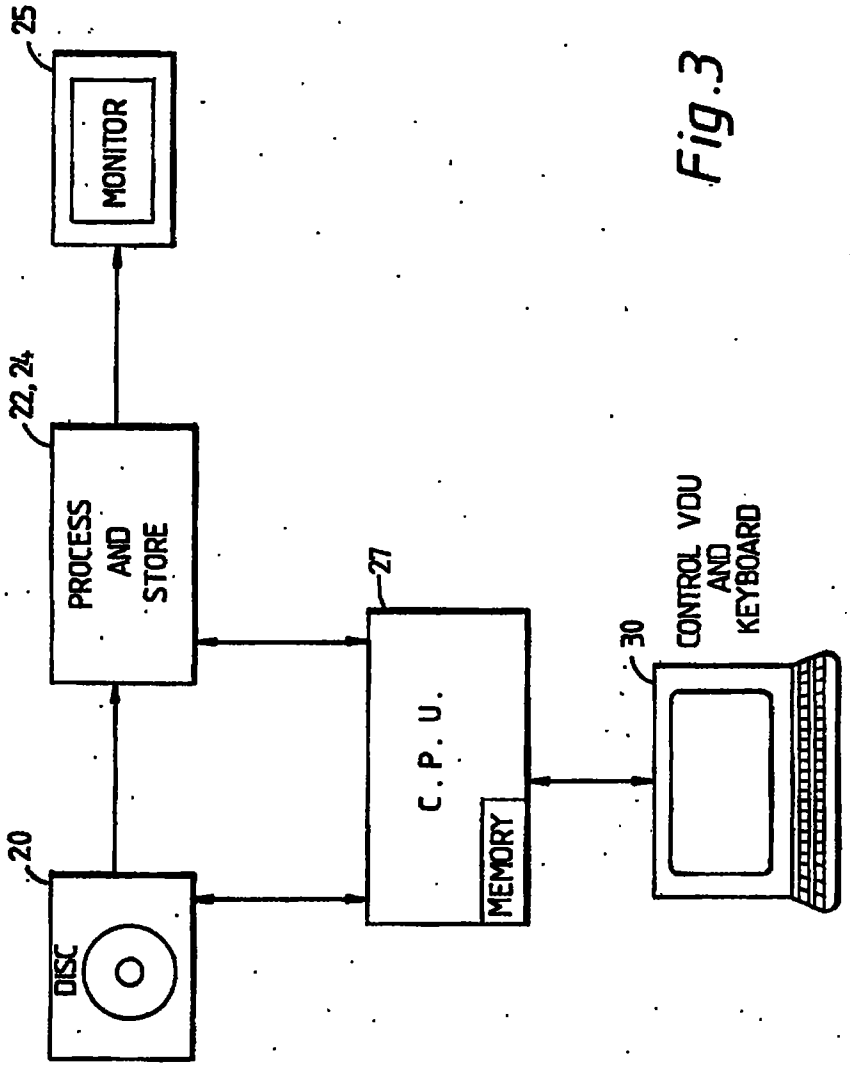

25
MONITOR
22, 24
PROCESS AND STORE
27
C. P. U.
MEMORY
30
CONTROL VDU AND KEYBOARD
20
DISC

Fig. 3

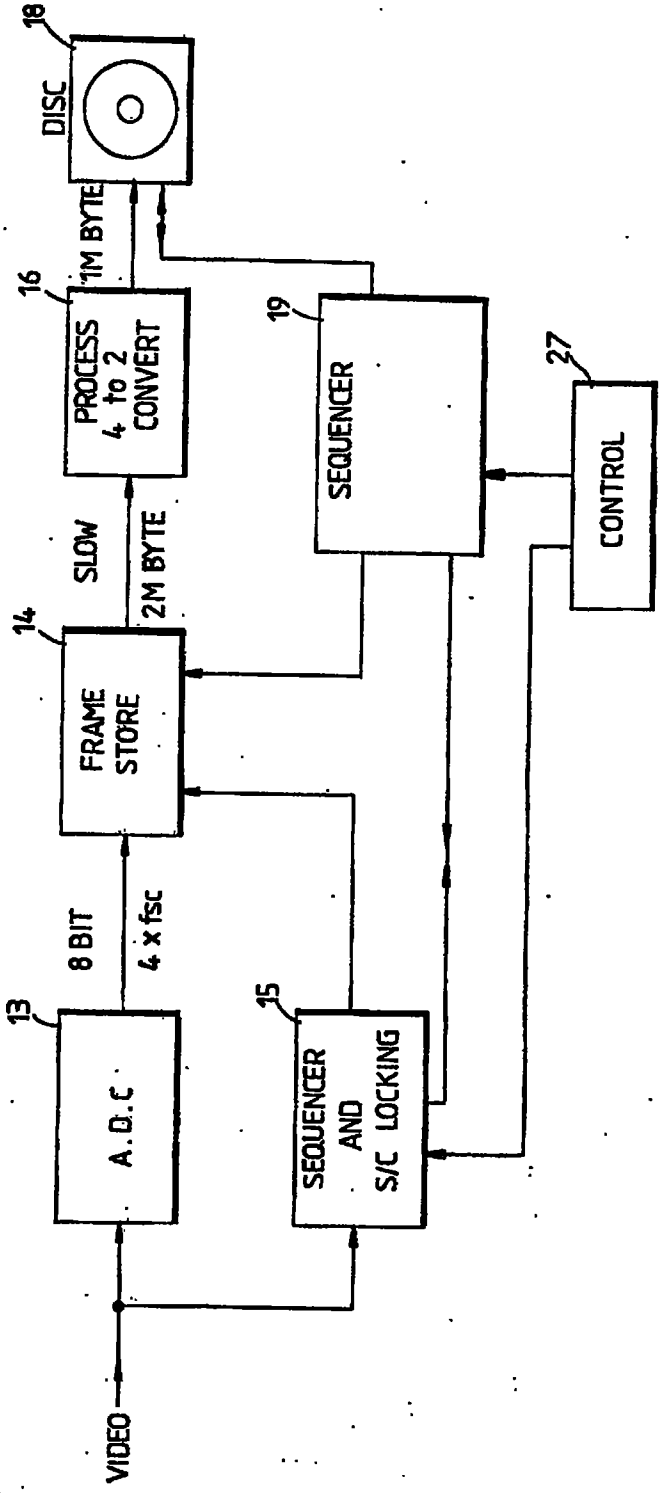

18
DISC
1M BYTE
16
PROCESS 4 to 2 CONVERT
19
SEQUENCER
27
CONTROL
SLOW
2M BYTE
14
FRAME STORE
8 BIT
4 x fsc
13
A.D.C
15
SEQUENCER AND S/C LOCKING
VIDEO

Fig. 4

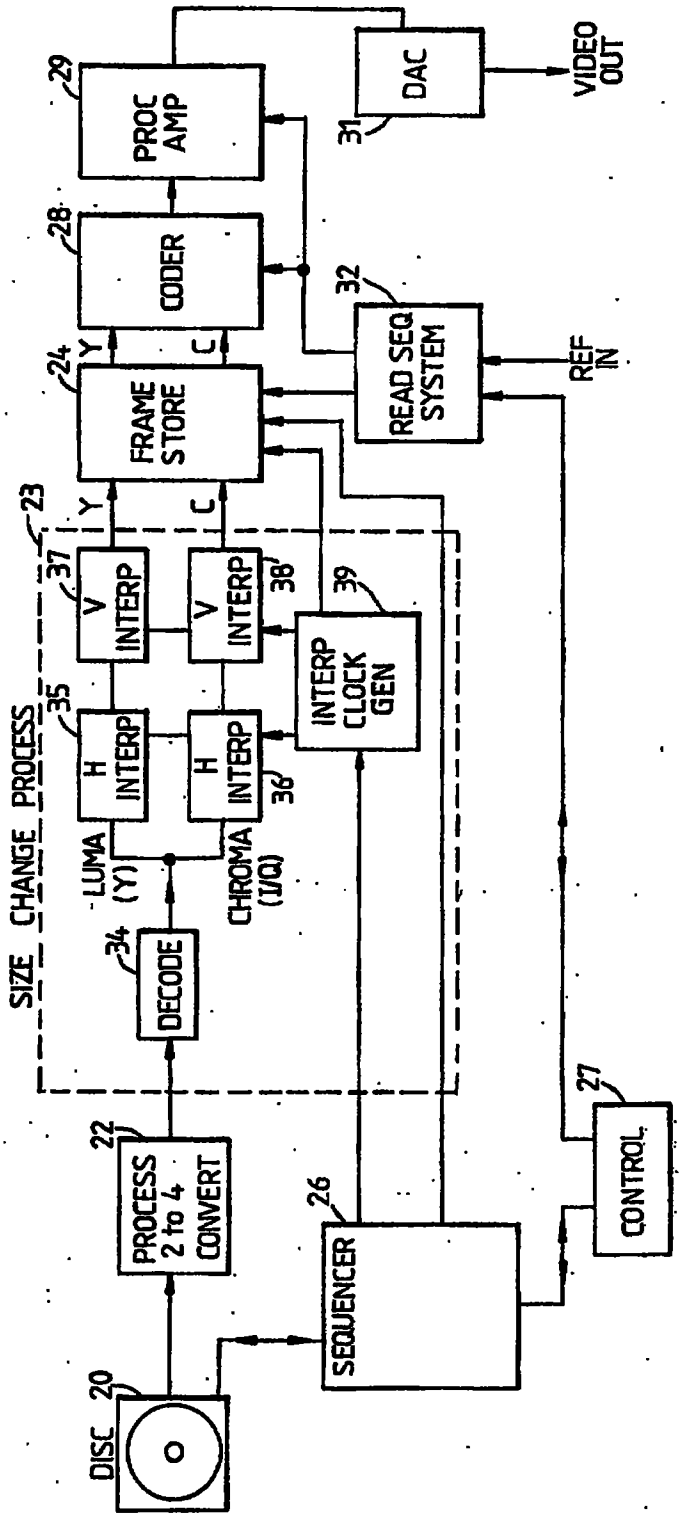
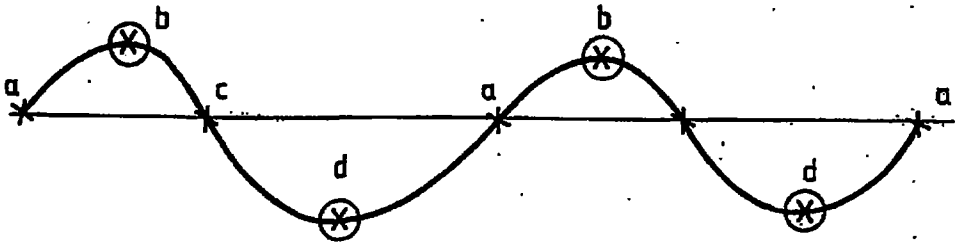

29
PROC AMP
DAC
31
VIDEO OUT
28
CODER
32
READ SEQ SYSTEM
REF IN
24
Y
C
FRAME STORE
23
Y
C
37
V INTERP
38
V INTERP
39
INTERP CLOCK GEN
35
H INTERP
36
H INTERP
SIZE CHANGE PROCESS
LUMA (Y)
CHROMA (I/Q)
34
DECODE
22
PROCESS 2 to 4 CONVERT
26
SEQUENCER
27
CONTROL
20
DISC

Fig.5



X=4 fsc samples

O=2 fsc samples

Fig.6

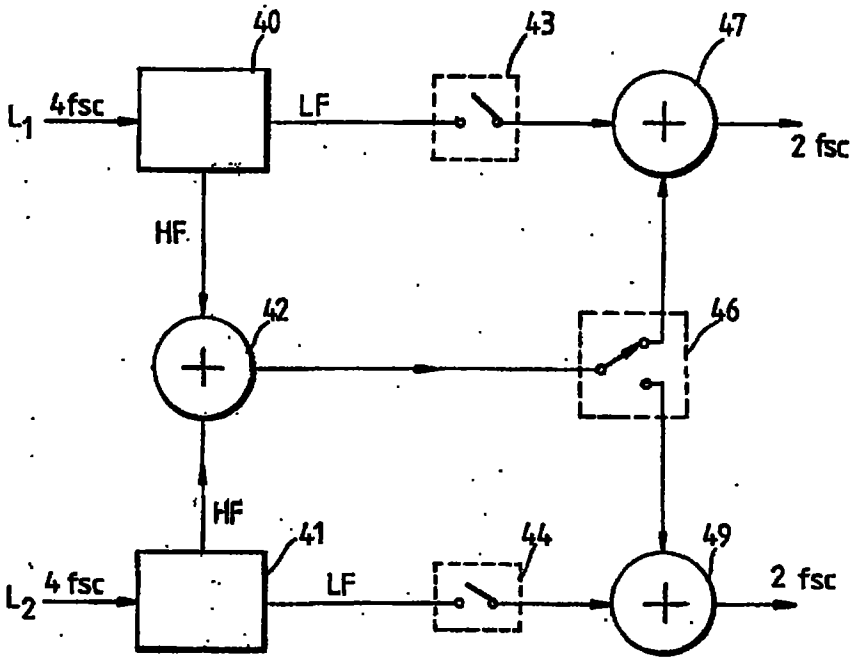


Fig.7

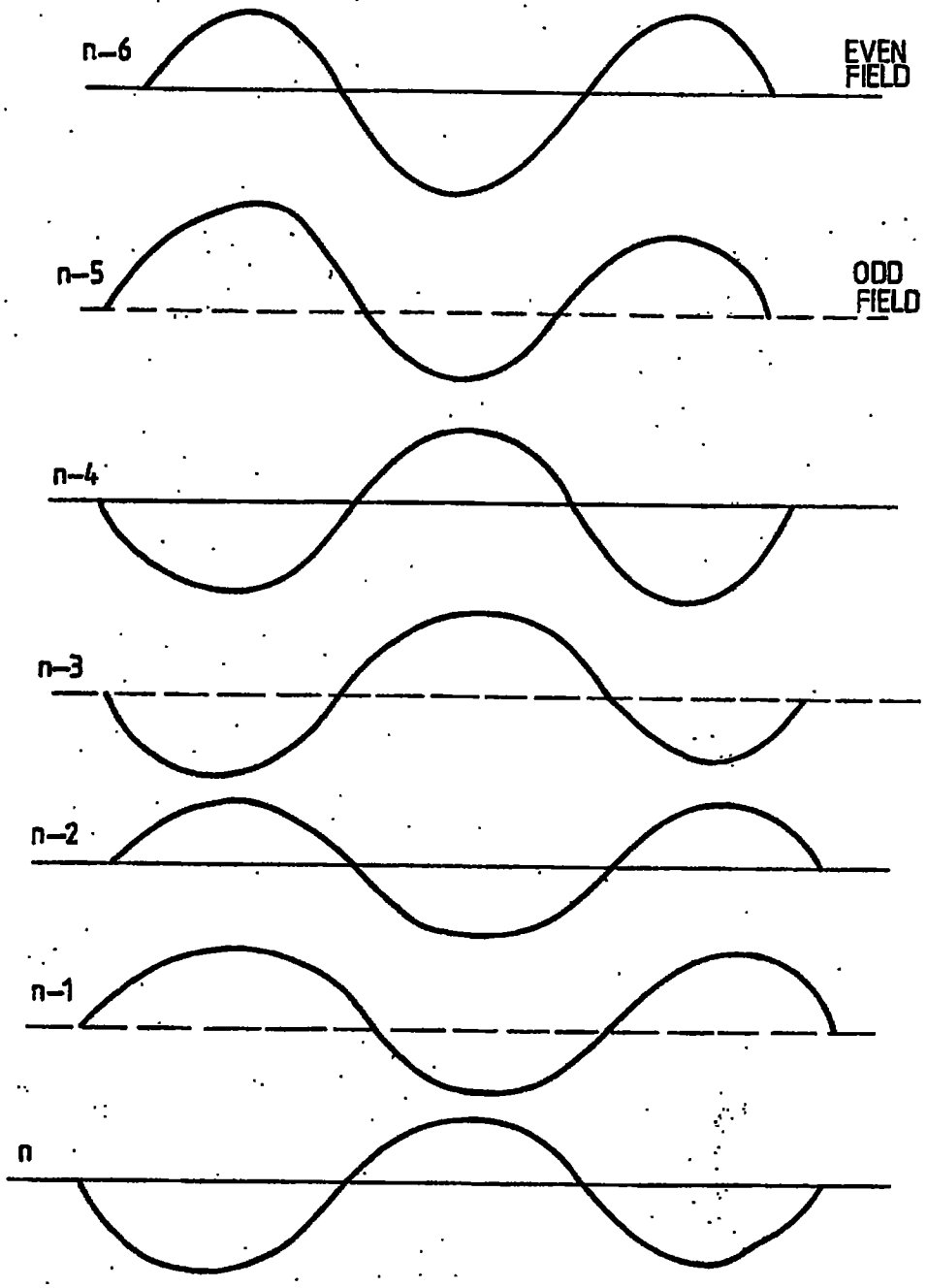


Fig.8

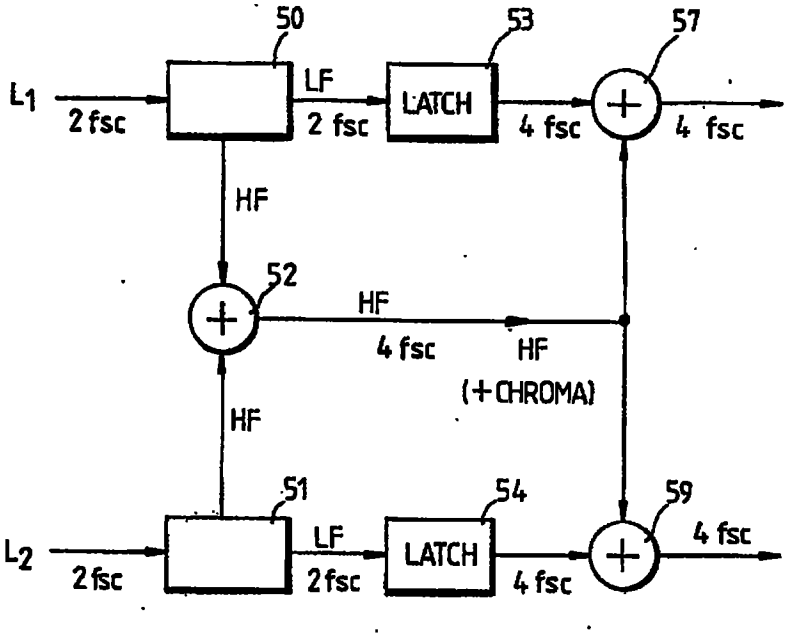

50
53
57
L1
2 fsc
LF
2 fsc
LATCH
4 fsc
4 fsc
HF
52
HF
4 fsc
HF
(+CHROMA)
HF
51
54
59
L2
2 fsc
LF
2 fsc
LATCH
4 fsc
4 fsc

Fig. 9

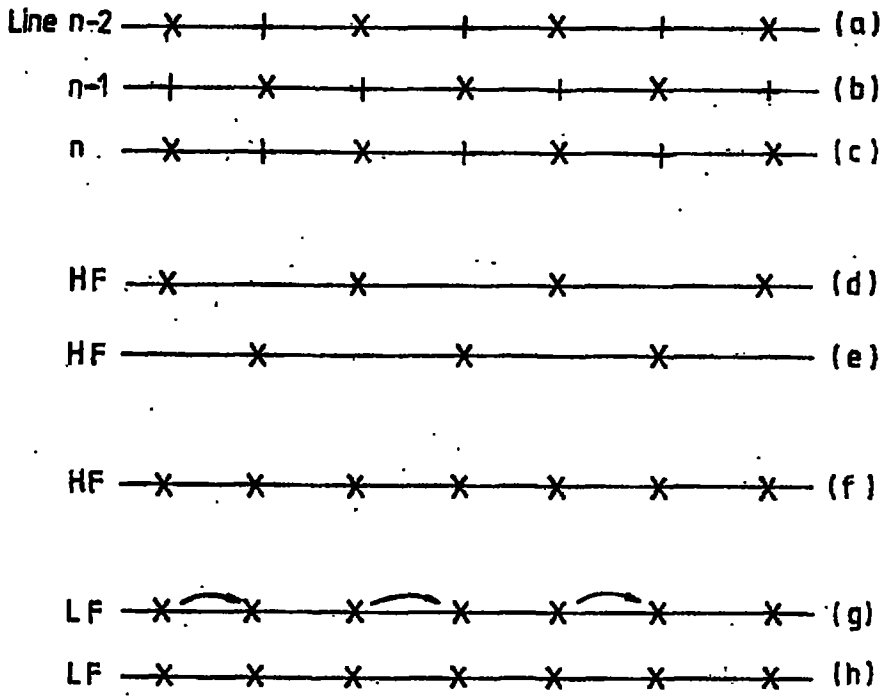


Fig. 10

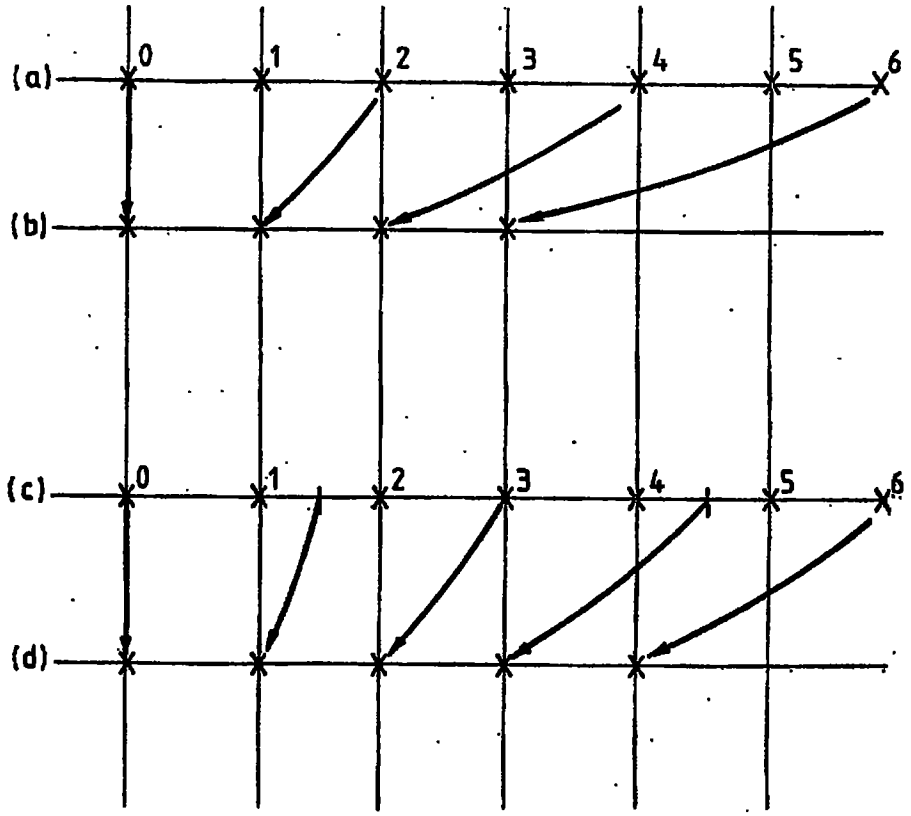


Fig. 11

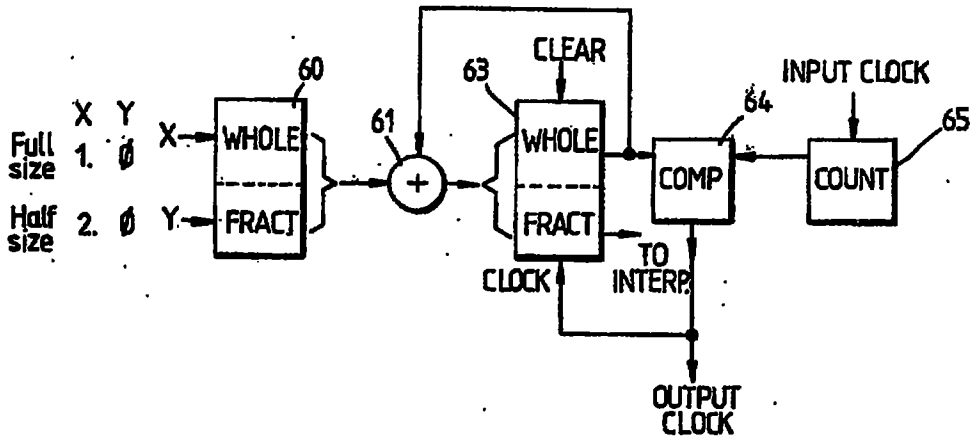

X Y
Full size 1. Ø
Half size 2. Ø
X
Y
60
WHOLE
FRACT
61
+
63
CLEAR
WHOLE
FRACT
CLOCK
64
COMP
TO INTERP.
INPUT CLOCK
65
COUNT
OUTPUT CLOCK

Fig. 12

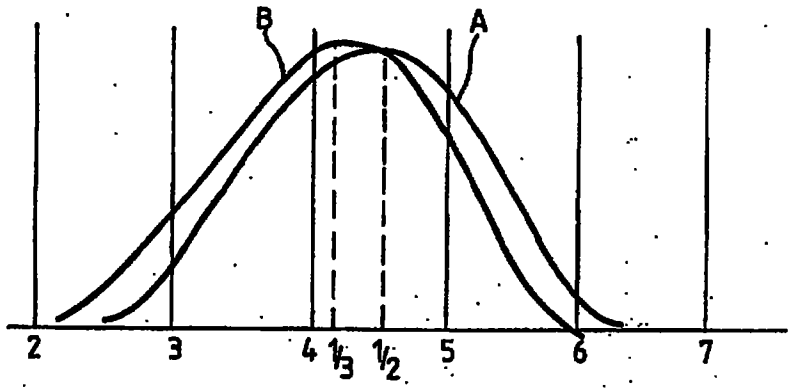

B
A
2
3
4
1/3
1/2
5
6
7

Fig. 13

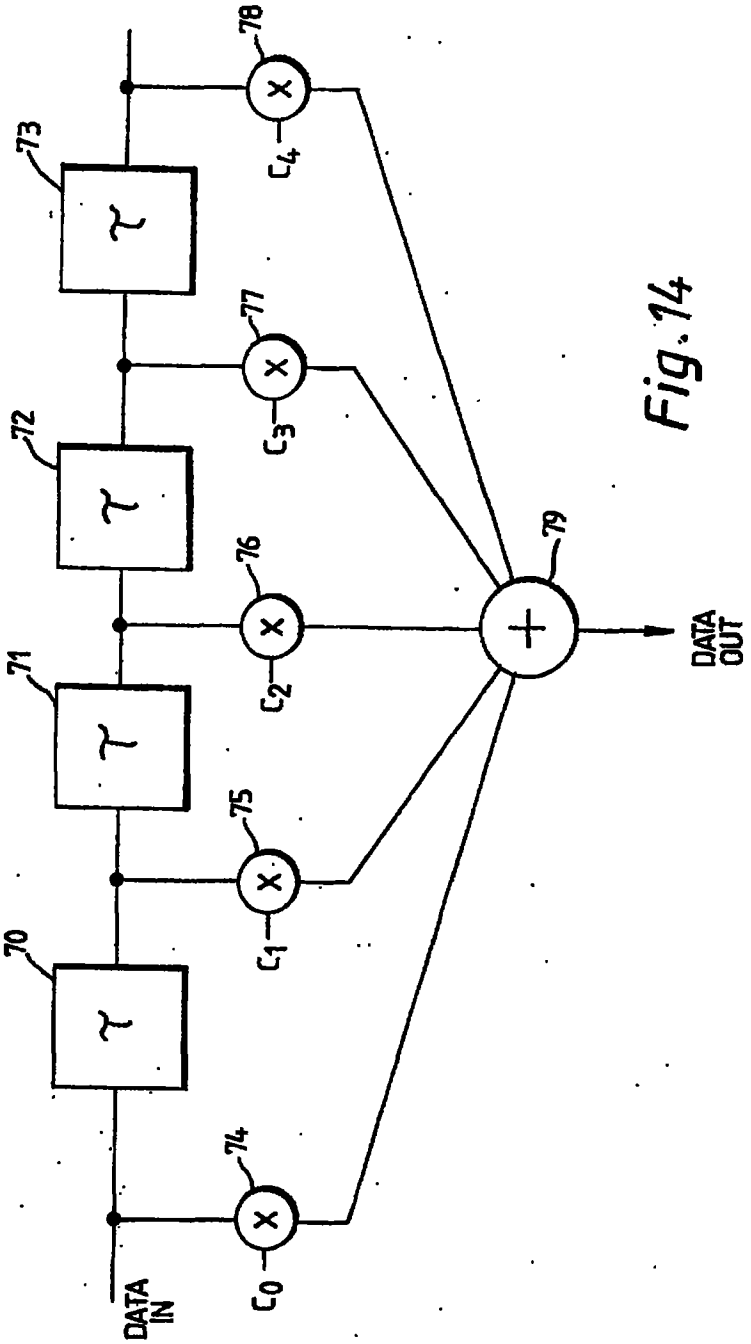


Fig. 14

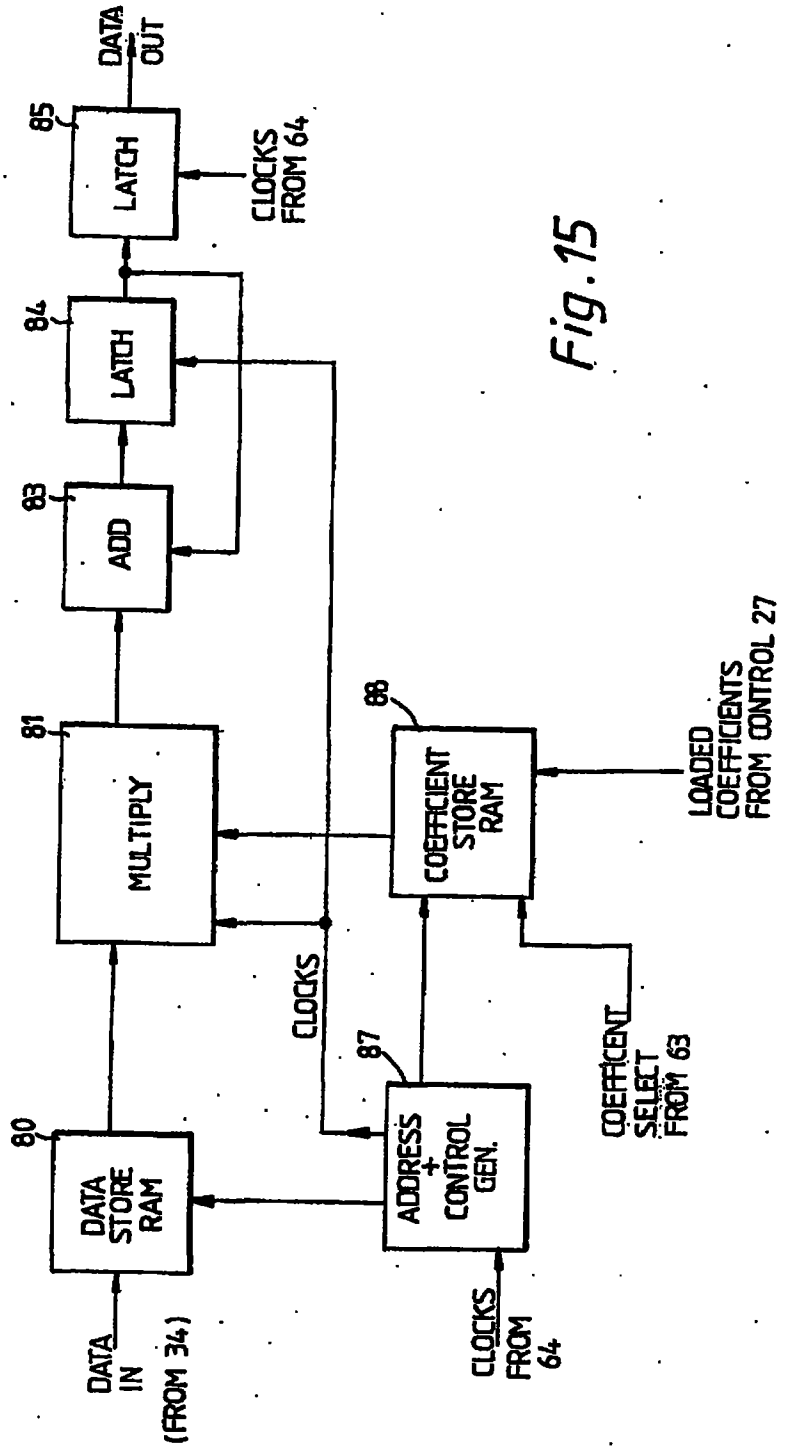

DATA OUT
85
LATCH
CLOCKS FROM 64
84
LATCH
83
ADD
81
MULTIPLY
86
COEFFICIENT STORE RAM
LOADED COEFFICIENTS FROM CONTROL 27
CLOCKS
87
ADDRESS + CONTROL GEN.
COEFFICENT SELECT FROM 63
80
DATA STORE RAM
DATA IN (FROM 34)
CLOCKS FROM 64

Fig. 15

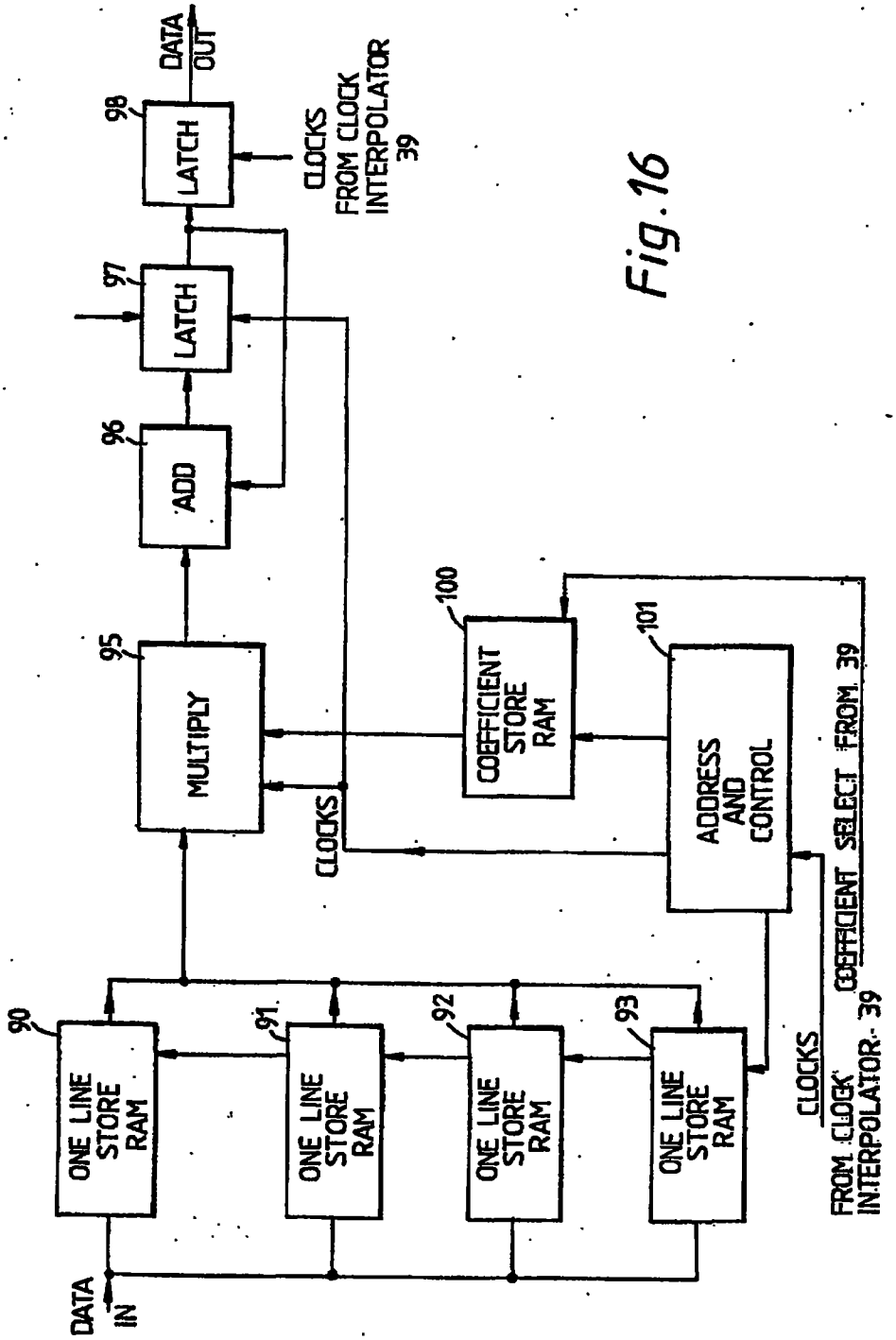

DATA OUT
98
LATCH
CLOCKS FROM CLOCK INTERPOLATOR 39
97
LATCH
96
ADD
95
MULTIPLY
100
COEFFICIENT STORE RAM
101
ADDRESS AND CONTROL
CLOCKS
COEFFICIENT SELECT FROM 39
CLOCKS FROM CLOCK INTERPOLATOR 39
90
ONE LINE STORE RAM
91
ONE LINE STORE RAM
92
ONE LINE STORE RAM
93
ONE LINE STORE RAM
DATA IN

Fig. 16